VOLUME 2 | 2023

THE WINGS

SCIENTIFIC NEWSLETTER

For Private Circulation Only
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"FREEDOM FROM FEAR OF CANCER"

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Clinical Research Secretariat
National Cancer Institute, Nagpur

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CERVICAL CANCER – DIAGNOSIS AND MANAGEMENT

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INTRODUCTION

Cervical cancer starts in the cervix, which is the lower, narrow part of the uterus. The uterus holds the growing fetus during pregnancy. The cervix connects the lower part of the uterus to the vagina and, with the vagina, forms the birth canal.

Cervical cancer begins when healthy cells on the surface of the cervix change or get infected with human papillomavirus (HPV) and grow out of control, forming a mass called a tumor. Long-term infection of HPV on the cervix can result in cancer, leading to a mass or tumor on the cervix. A tumor can be cancerous or benign. A cancerous tumor is malignant, meaning it can spread to other parts of the body. A benign tumor means the tumor will not spread.

Cervical cancer is most often diagnosed between the ages of 35 and 44. The average age of diagnosis is 50. About 20% of cervical cancers are diagnosed after age 65. Usually these cases occur in people who did not receive regular cervical cancer screenings before age 65. It is rare for people younger than 20 to develop cervical cancer.

DEFINITION

Cancer that forms in tissues of the cervix (the organ connecting the uterus and vagina). It is usually a slow-growing cancer that may not have symptoms but can be found with regular Pap tests (a procedure in which cells are scraped from the cervix and looked at under a microscope). Cervical cancer is almost always caused by human papillomavirus (HPV) infection.

RISK FACTOR

- Human papillomavirus (HPV) infection
- Immune system deficiency
- Herpes
- Smoking
- Age
- Socioeconomic factors
- Oral contraceptives
- Exposure to diethylstilbestrol (DES)

SIGNS AND SYMPTOMS

- Any of the following could be signs or symptoms cervical cancer
- Blood spots or light bleeding between or following periods
- Menstrual bleeding that is longer and heavier than usual
- Bleeding after intercourse, douching, or a pelvic examination
- Increased vaginal discharge
- Pain during sexual intercourse
- Bleeding after menopause
- Unexplained, persistent pelvic and/or back pain

DIAGNOSIS

The following tests may be used to diagnose cervical cancer:

Bimanual pelvic examination and sterile speculum examination-

Any unusual changes in the patient's cervix, uterus, vagina, ovaries, and other nearby organs, changes in vulva outside the body is visualized using an instrument called a speculum to keep the vaginal walls open. A Pap test is often done at the same time. Some of the nearby organs are not visible during this exam, so insert 2 fingers of 1 hand inside the vagina while the other hand gently presses on the lower abdomen to feel the uterus and ovaries.

Pap test

During a Pap test, gently scrapes the outside and inside of the cervix, take samples of cells for testing.

Improved Pap test methods have made it easier to find cancerous cells. Traditional Pap tests can be hard to read because cells can be dried out, covered with mucus or blood, or may clump together on the slide.

The liquid-based cytology test, often referred to as ThinPrep or SurePath, transfers a thin layer of cells onto a slide after removing blood or mucus from the sample. The sample is preserved so other tests can be done at the same time, such as the HPV test.

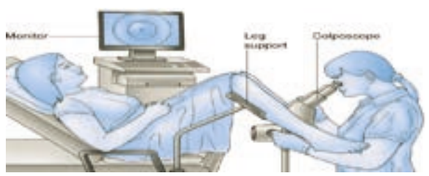
Computer screening, often called AutoPap or FocalPoint, uses a computer to scan the sample for abnormal cells.

HPV typing test

An HPV test is similar to a Pap test. The test is done on a sample of cells from the cervix. Test for HPV at the same time as a Pap test or after Pap test results show abnormal changes to the cervix. Certain types or strains of HPV, called high-risk HPV, such as HPV16 and HPV18, are seen more often in women with cervical cancer and may help confirm a diagnosis. If the HPV test is "positive," this means the test found the presence of high-risk HPV. Many women have HPV but do not have cervical cancer, so HPV testing alone is not enough for a diagnosis of cervical cancer.

Colposcopy

Colposcopy may done to check the cervix for abnormal areas. Colposcopy can also be used to help guide a biopsy of the cervix. During a colposcopy, a special instrument called a colposcope is used. The colposcope magnifies the cells of the cervix and vagina, similar to a microscope. It gives the lighted, magnified view of the tissues of the vagina and the cervix. The colposcope is not inserted into the body, and the examination is similar to a speculum examination. It can be done in the clinics and has no side effects. It can also be done on pregnant women.



Biopsy

A biopsy is the removal of a small amount of tissue for examination under a microscope. Other tests can suggest that cancer is present, but only a biopsy can make a definite diagnosis. If the lesion is small, it may remove all during the biopsy.

There are several types of biopsies. Most are usually done in the Clinics, sometimes using a local anesthetic to numb the area. There may be some bleeding and other discharge after a biopsy. There may also be discomfort similar to menstrual cramps.

One common biopsy method uses an instrument to pinch off small pieces of cervical tissue. Other types of biopsies include:

Endocervical curettage (ECC). To check an area inside the opening of the cervix that cannot be seen during a colposcopy, then use ECC. During this procedure, a small, spoon-shaped instrument called a curette is used to scrape a small amount of tissue from inside the cervical opening.

Loop electrosurgical excision procedure (LEEP). LEEP uses an electrical current passed through a thin wire hook. The hook removes tissue for examination in the laboratory. A LEEP may also be used to remove a precancer or an early-stage cancer.

Conization (a cone biopsy). This removes a cone-shaped piece of tissue from the cervix. Conization may be done as treatment to remove a precancer or an early-stage cancer. It is done under a general or local anesthetia.

Pelvic examination under anesthesia. In cases where it is necessary for treatment planning, re-examine the pelvic area while the patient is under anesthesia to see if the cancer has spread to any organs near the cervix, including the uterus, vagina, bladder, or rectum.

X-ray. An x-ray is a way to create a picture of the structures inside of the body using a small amount of radiation. An intravenous urography is a type of x-ray that is used to view the kidneys and bladder.

Computed tomography (CT or CAT) scan. A CT scan takes pictures of the inside of the body using x-rays taken from different angles. A computer combines these pictures into a detailed, 3-dimensional image that shows any abnormalities or tumors. A CT scan can be used to measure the tumor's size. Sometimes, a special dye called a contrast medium is given before the scan to provide better detail on the image. This dye can be injected into a patient's vein or given as a pill or liquid to swallow.

Magnetic resonance imaging (MRI). An MRI uses magnetic fields, not x-rays, to produce detailed images of the body. MRI can be used to measure the tumor's size. A special dye called a contrast medium is given before the scan to create a clearer picture. This dye can be injected into a patient's vein or given as a pill or liquid to swallow.

Positron emission tomography (PET) or PET-CT scan. A PET scan is usually combined with a CT scan, called a PET-CT scan. However, you may hear your doctor refer to this procedure just as a PET scan. A PET scan is a way to create pictures of organs and tissues inside the body. A small amount of a radioactive sugar substance is injected into the patient's body. This sugar substance is taken up by cells that use the most energy. Because cancer tends to use energy actively, it absorbs more of the radioactive substance. A scanner then detects this substance to produce images of the inside of the body.

Cystoscopy. A cystoscopy is a procedure that allows the doctor to view the inside of the bladder and urethra (the canal that carries urine from the bladder) with a thin, lighted tube called a cystoscope. The person may be sedated as the tube is inserted in the urethra. A cystoscopy is used to determine whether cancer has spread to the bladder.

Sigmoidoscopy (also called proctoscopy) A sigmoidoscopy is a procedure that allows the doctor to see the colon and rectum with a thin, lighted, flexible tube called a Sigmoidoscope. The person may be sedated as the tube is inserted in the rectum. A sigmoidoscopy is used to see if the cancer has spread to the rectum

VACCINE RECOMMENDATION

1.Gardasil- Quadrivalent Vaccine

Prevent from 4 HPV infection i.e. Human Papilloma Virus Type- 6,11,16,18

2.Cervarix- Bivalent Vaccine

Prevent from 2 HPV infection i.e. Human Papilloma Virus Type- 6,11

3.9vHPV- Nenavalent Vaccine also called Gardasil 9

Prevent from 9 HPV infection i.e. Human Papilloma Virus Type-6,11,16,18,31,33, 45,52,58

MANAGEMENT

Treatment

Treatment for cervical cancer depends on several factors, such as the stage of the cancer, other health problems you may have and your preferences. Surgery, radiation, chemotherapy or a combination of the three may be used.

Surgery

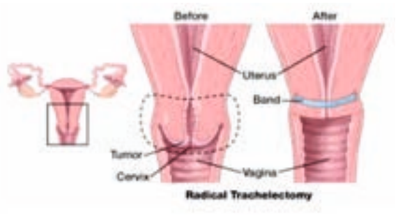
Early-stage cervical cancer is typically treated with surgery. Which operation is best for you will depend on the size of your cancer, its stage and whether you would like to consider becoming pregnant in the future.

Options might include:

Surgery to cut away the cancer only. For a very small cervical cancer, it might be possible to remove the cancer entirely with a cone biopsy. This procedure involves cutting away a cone-shaped piece of cervical tissue, but leaving the rest of the cervix intact. This option may make it possible for you to consider becoming pregnant in the future.

Surgery to remove the cervix (trachelectomy). Early-stage cervical cancer might be treated with a radical trachelectomy procedure, which removes the cervix and some surrounding tissue. The uterus remains after this procedure, so it may be possible to become pregnant, if you choose.

Surgery to remove the cervix and uterus (hysterectomy). Most early-stage cervical cancers are treated with a radical hysterectomy operation, which involves removing



the cervix, uterus, part of the vagina and nearby lymph nodes. A hysterectomy can cure early-stage cervical cancer and prevent recurrence. But removing the uterus makes it impossible to become pregnant.

Minimally invasive hysterectomy, which involves making several small incisions in the abdomen rather than one large incision, may be an option for early-stage cervical cancer. People who undergo minimally invasive surgery tend to recover more quickly and spend less time in the hospital.

RADIATION

Radiation therapy uses high-powered energy beams, such as X-rays or protons, to kill cancer cells. Radiation therapy is often combined with chemotherapy as the primary treatment for locally advanced cervical cancers. It can also be used after surgery if there's an increased risk that the cancer will come back.

Radiation therapy can be given:

·Externally, by directing a radiation beam at the affected area of the body (external beam radiation therapy)

·Internally, by placing a device filled with radioactive material inside your vagina, usually for only a few minutes (brachytherapy)

·Both externally and internally

Chemotherapy

Chemotherapy is a drug treatment that uses chemicals to kill cancer cells. It can be given through a vein or taken in pill form. Sometimes both methods are used.

For locally advanced cervical cancer, low doses of chemotherapy are often combined with radiation therapy, since chemotherapy may enhance the effects of the radiation. Higher doses of chemotherapy might be recommended to help control symptoms of very advanced cancer.

Targeted therapy

Targeted drug treatments focus on specific weaknesses present within cancer cells. By blocking these weaknesses, targeted drug treatments can cause cancer cells to die. Targeted drug therapy is usually combined with chemotherapy. It might be an option for advanced cervical cancer.

Immunotherapy

Immunotherapy is a drug treatment that helps your immune system to fight cancer. Body's disease-fighting immune system might not attack cancer because the cancer cells produce proteins that make them undetectable by the immune system cells. Immunotherapy works by interfering with that process. For cervical cancer, immunotherapy might be considered when the cancer is advanced and other treatments aren't working.

Supportive (palliative) care

Palliative care is specialized medical care that focuses on providing relief from pain and other symptoms of a serious illness. When palliative care is used along with all of the other appropriate treatments, people with cancer may feel better and live longer.

Palliative care is provided by a team of doctors, nurses and other specially trained professionals. Palliative care teams aim to improve the quality of life for people with cancer and their families. This form of care is offered alongside curative or other treatments you may be receiving.

NURSING MANAGEMENT

Oncology nurses are important in the patient's health care team, providing support, education, and connecting patients with resources. Nurses are involved in the care of the patient in many different settings:

- **Gynecological oncology**
- **Radiation oncology**
- **Medical oncology**
- **Infusion centers**
- **Inpatient and procedural visits**

In these various settings, nurses can educate cervical cancer patients on the importance of adhering to treatment schedules, anticipated side effects, and how to manage them. Nurses also have the opportunity to educate patients on HPV vaccinations and regular cancer screenings in efforts of primary and secondary prevention.

Nurses may need to follow lab results and report any abnormal findings, especially with white blood cell and red blood cell counts. Patients are at risk for neutropenia and anemia when receiving chemotherapy and if experiencing any bleeding. Patients undergoing radiation therapy may need skincare guidance. Potential side effects of treatment are nausea, vomiting, and diarrhea, so it is also important to monitor lab values and vital signs for signs of dehydration or electrolyte imbalance.

- Identify the cause of cervical cancer
- Explain the current cervical cancer screening and vaccination recommendations
- Discuss disparities in cervical cancer screening and diagnosis among various populations
- Identify potential nursing diagnoses for people with cervical cancer
- Analyze the role of the nurse in interdisciplinary cervical cancer care

Nursing Management in Radiation Therapy

- Assessment. The nurse assesses the patient's skin and oropharyngeal mucosa regularly when radiation therapy is directed to these areas, and also the nutritional status and general well-being should be assessed.
- Symptoms. If systemic symptoms, such as weakness and fatigue, occur, the nurse explains that these symptoms are a result of the treatment and do not represent deterioration or progression of the disease.
- **Safety precautions**. Safety precautions used in caring for a patient receiving brachytherapy include assigning the patient to a private room, posting appropriate notices about radiation safety precautions, having staff members wear dosimeter badges, making sure that pregnant staff members are not assigned to the patient's care, prohibiting visits by children and pregnant visitors, limiting visits from others to 30 minutes daily, and seeing that visitors maintain a 6 foot distance from the radiation source.

Chemotherapy

In chemotherapy, antineoplastic agents are used in an attempt to destroy tumor cells by interfering with cellular functions, including replication.

- Goal. The goal of treatment is the eradication of enough tumor so that the remaining tumor cells can be destroyed by the body's immune system.
- Proliferating cells. Actively proliferating cells within a tumor are the most sensitive to chemotherapeutic agents.
- Nondividing cells. Nondividing cells capable of future proliferation are the least sensitive to antineoplastic medications and consequently are potentially dangerous.
- Cell cycle-specific. Cell cycle-specific agents destroy cells that are actively reproducing by means of the cell-cycle; most affect cells in the S phase by interfering with DNA and RNA synthesis.
- Cell cycle-nonspecific. Chemotherapeutic agents that act independently of the cell cycle phases are cell cycle nonspecific, and they usually have a prolonged effect on cells, leading to cellular damage and death.

Antineoplastic Agents

Chemotherapeutic agents are also classified by chemical group, each with a different mechanism of action.

- Alkylating agents. Alters DNA structure by misreading DNA code, initiating breaks in the DNA molecule, cross-linking DNA strands
- Nitrosoureas. Similar to the alkylating agents, but they can cross the blood-brain barrier.
- Topoisomerase I inhibitors. Induce breaks in the DNA strand by binding to enzyme topoisomerase I, preventing cells from dividing.
- Antimetabolites. Antimetabolites interfere with the biosynthesis of metabolites or nucleic acids necessary for RNA and DNA synthesis.
- Antitumor antibiotics. Interfere with DNA synthesis by binding DNA and prevent RNA synthesis.

• Mitotic spindle poisons. Arrest metaphase by inhibiting mitotic tubular formation and inhibiting DNA and protein synthesis.

• Hormonal agents. Hormonal agents bind to hormone receptor sites that alter cellular growth; blocks binding of estrogens to receptor sites; inhibit RNA synthesis; suppress aromatase of P450 system, which decreases level.

Nursing Management in Chemotherapy

Nurses play an important role in assessing and managing many of the problems experienced by patients undergoing chemotherapy.

• Assessing fluid and electrolyte balance. Anorexia, nausea, vomiting, altered taste, mucositis, and diarrhea put patients at risk for nutritional and fluid electrolyte disturbances.

• Modifying risks for infection and bleeding. Suppression of the bone marrow and immune system is expected and frequently serves as a guide in determining appropriate chemotherapy dosage but increases the risk of anemia, infection, and bleeding disorders.

• Administering chemotherapy. The patient is observed closely during its administration because of the risk and consequences of extravasation, particularly of vesicant agent.

• Protecting caregivers. Nurses must be familiar with their institutional policies regarding personal protective equipment, handling and disposal of chemotherapeutic agents and supplies, and management of accidental spills or exposures.

Bone Marrow Transplantation

The role of bone marrow transplantation (BMT) for malignant and some nonmalignant diseases continues to grow.

Type of Bone Marrow Transplant

Types of BMT based on the source of donor cells include:

• Allogeneic. Allogeneic is from a related donor other than the patient; donor may be a related donor or a matched unrelated donor.

• Autologous. Autologous BMT is from the patient himself.

• Syngeneic. Syngeneic BMT is from an identical twin.

Nursing Management in Bone Marrow Transplantation

Nursing care of patients undergoing BMT is complex and demands a high level of skill.

• Implementing pretransplantation care. Nutritional assessments, extensive physical examinations, organ function tests, and psychological evaluations are conducted, with blood work that includes assessing past antigen exposure, and the patient's support system, financial, and insurance resources are also evaluated.

• Providing care during treatment. Nursing management during bone marrow infusion or stem cell infusions consists of monitoring the patient's vital signs and blood oxygen saturation; assessing for adverse effects such as fever, chills, shortness of breath, chest pain, cutaneous reactions, nausea, vomiting, hypotension, or hypertension, tachycardia, anxiety, and taste changes; and providing ongoing support and patient teaching.

• Providing post-transplantation care. Ongoing nursing assessments such as psychosocial assessments in follow-up visits are essential to detect late effects of therapy after BMT, which occur 100 days or more after the procedure, and donors also require nursing care through being assisted in maintaining realistic expectations of themselves as well as of the patient.

Maintaining Tissue Integrity

• Stomatitis. Assessment of the patient's subjective experience and an objective assessment of the oropharyngeal tissues and teeth are important and for the treatment of oral mucositis, Palifermin (Kepivance), a synthetic form of human keratinocyte growth factor, could be administered.

• Radiation-associated skin impairment. Nursing care for patients with impaired skin reactions includes maintaining skin integrity, cleansing the skin, promoting comfort, reducing pain, preventing additional trauma, and preventing and managing infection.

• Alopecia. Nurses provide information about hair loss and support the patient and family in coping with changes in body image.

• Malignant skin lesions. Nursing care includes cleansing the skin, reducing superficial bacteria, controlling bleeding, reducing odor, protecting the skin from further trauma, and relieving pain.

Promoting Nutrition

• Anorexia. Anorexia may occur because people feel full after eating only a small amount of food.

• Malabsorption. Surgical intervention may change peristaltic patterns, later gastrointestinal secretions, and reduce the absorptive surfaces of the gastrointestinal mucosa, all leading to malabsorption.

• Cachexia. Nurses assess patients who are at risk of altered nutritional intake so that appropriate measures may be instituted prior to nutritional decline.

Relieving Pain

• Assessment. The nurse assesses the patient for the source and site of pain as well as those factors that increase the patient's perception of pain.

• Cancer pain algorithm. Various opioid and nonopioid medications may be combined with other medications to control pain as adapted from the World Health Organization three-step ladder approach.

• Education. The nurse provides education and support to correct fears and misconceptions about opioid use.

Decreasing Fatigue

• Assessment. The nurse assesses physiologic and psychological stressors that can contribute to fatigue and uses several assessment tools such as a simple visual analog scale to assess levels of fatigue.

• Exercise. The role of exercise as a helpful intervention has been supported by several controlled trials.

• Pharmacologic interventions. Occasionally pharmacologic interventions are utilized, including antidepressants for patients with depression, anxiolytics for those with anxiety, hypnotics for patients with sleep disturbances, and psychostimulants for some patients with advanced cancer or fatigue that does not respond to any medication.

Improving Body Image and Self-esteem

• Assessment. The nurse identifies potential threats to the patient's body image experience, and the nurse assesses the patient's ability to cope with the many assaults to the body image experienced throughout the course of the disease and treatment.

• Sexuality. Nurses who identify physiologic, psychologic or communication difficulties related to sexuality or sexual function are in a key position to help patients seek further specialized evaluation and intervention if necessary.

Assisting in the Grieving Process

• Assessment. The nurse assesses the patient's psychological and mental status, as well as the mood and emotional reaction to the results of diagnostic testing and prognosis.

Grieving

• Grieving is a normal response to these fears and to actual or potential losses.

Monitoring and Managing Potential Complications

• Infection. The nurse monitors laboratory studies to detect any early changes in WBC counts.

Septic shock

• Neurologic assessments are carried out, fluid and electrolyte status is monitored, arterial blood gas values and pulse oximetry are monitored, and IV fluids, blood, and vasopressors are administered by the nurse.

• **Bleeding and hemorrhage**. The nurse may administer IL-11, which has been approved by the FDA to prevent severe thrombocytopenia, and additional medications may be prescribed to address bleeding due to disorders of coagulation.

Promoting Home and Community-Based Care

Nurses in the outpatient settings often have the responsibilities for patient teaching and for coordinating care in the home.

• **Teaching patientself-care**. Follow-up visits and telephone calls from the nurse assist in identifying problems and are often reassuring, increasing the patient's and the family's comfort in dealing with complex and new aspects of care.

• **Continuing care**. The responsibilities of the home care include assessing the home environment, suggesting modifications at home or in care to help the patient and the family address the patient's physical needs.

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02

BREAST CANCER DIAGNOSIS AND MANAGEMENT

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INTRODUCTION

Cancer begins when healthy cells in the breast change and grow out of control, forming a mass or sheet of cells called a tumor. A tumor can be cancerous or benign. A cancerous tumor is malignant, meaning it can grow and spread to other parts of the body. A benign tumor means the tumor can grow but will not spread.Breast cancer spreads when the cancer grows into adjacent organs or other parts of the body or when breast cancer cells move to other parts of the body through the blood vessels and/or lymph vessels. This is called a metastasis.Although breast cancer most commonly spreads to nearby lymph nodes, it can also spread further through the body to areas such as the bones, lungs, liver, and brain. This is called metastatic or stage IV breast cancer and is the most advanced type of breast cancer. However, the involvement of lymph nodes alone is generally not stage IV breast cancer. If breast cancer comes back after initial treatment, it can recur locally, meaning in the same breast and/or regional lymph nodes. It can also recur elsewhere in the body, called a distant recurrence or metastatic recurrence.

DEFINITION OF BREAST CANCER

Cancer that forms in tissues of the breast. The most common type of breast cancer is ductal carcinoma, which begins in the lining of the milk ducts(thin tubes that carry milk from the lobules of the breast to the nipple

RISK FACTORS

A risk factor is anything that increases a person's chance of developing cancer. Although risk factors often influence the development of cancer, most do not directly cause cancer. Some people with several risk factors never develop cancer, while others with no known risk factors do.

The following factors may raise a woman's risk of developing breast cancer:

Age. The risk of developing breast cancer increases as a woman ages, with most cancers developing in women older than 50.

Personal history of breast cancer. A woman who has had breast cancer in 1 breast has a higher risk of developing a new cancer in either breast.

Family history of breast cancer. Breast cancer may run in the family in any of these situations:

•1 or more women are diagnosed with breast cancer at age 45 or younger

•1 or more women are diagnosed with breast cancer before age 50 with an additional family history of cancer, such as ovarian cancer, metastatic prostate cancer, and pancreatic cancer

•There are breast and/or ovarian cancers in multiple generations on one side of the family, such as having both a grandmother and an aunt on the father's side of the family who were both diagnosed with 1 of these cancers

•A woman in the family is diagnosed with a second breast cancer in the same or the other breast or has both breast and ovarian cancer.

•A male relative is diagnosed with breast cancer

•There is at least 1 close relative who was diagnosed with breast cancer at age 50 or younger, or ovarian cancer, prostate cancer, and/or pancreatic cancer

• Genetic testing

• Early menstruation and late menopause

• Timing of pregnancy

• Hormone replacement therapy after menopause

• Oral contraceptives or birth control pills

• Race and ethnicity

• Lifestyle factors

• Weight

• Physical activity

• Alcohol

• Food

• Socioeconomic factors

• Radiation exposure at a young age

SIGN & SYMPTOMS

The majority of women with breast cancer do not have any body changes (signs) or symptoms when they are first diagnosed with breast cancer.

•A lump that feels like a hard knot or a thickening in the breast or under the arm. It is important to feel the same area in the other breast to make sure the change is not a part of healthy breast tissue in that area.

•Change in the size or shape of the breast

•Nipple discharge that occurs suddenly, is bloody, or occurs in only 1 breast

•Physical changes, such as a nipple turned inward or a sore located in the nipple area

•Skin irritation or changes, such as puckering, dimpling, scaliness, or new creases

•A warm, red, swollen breast with or without a rash with dimpling resembling the skin of an orange, called "peaud'orange"

•Pain in the breast, particularly breast pain that does not go away. Pain is not usually a symptom of breast cancer, but it should be reported to a doctor.

DIAGNOSIS

For most types of cancer, a biopsy is the only sure way for the doctor to know if an area of the body has cancer. Biopsy is done where a small sample of tissue is sent for testing in a laboratory

The following tests may be used to diagnose breast cancer or for follow-up testing after a breast cancer diagnosis.

Imaging tests

• **Diagnostic mammography.** Diagnostic mammography is similar to screening mammography except that more pictures of the breast are taken. It is often used when a woman is experiencing signs, such as a new lump or nipple discharge.

• **Ultrasound.** An ultrasound uses sound waves to create a picture of the breast tissue. An ultrasound can distinguish between a solid mass, which may be cancer, and a fluid-filled cyst, which is usually not cancer.

• **MRI.** An MRI uses magnetic fields, not x-rays, to produce detailed images of the body. A special dye called a contrast medium is given before the scan to help create a clear picture of the possible cancer. This dye is injected into the patient's vein. A breast MRI may be used after a woman has been diagnosed with cancer to find out how much the disease has grown throughout the breast or to check the other breast for cancer.

Biopsy

A biopsy is the removal of a small amount of tissue for examination under a microscope. Other tests can suggest that cancer is present, but only a biopsy can make a definite diagnosis. Sample is analyzed for evaluating cells, tissues, and organs to diagnose the disease. There are different types of biopsies, classified by the technique and/or size of needle used to collect the tissue sample.

• **Fine needle aspiration biopsy.** This type of biopsy uses a thin needle to remove a small sample of cells.

• **Core needle biopsy.** This type of biopsy uses a wider needle to remove a larger sample of tissue. This is usually the preferred biopsy technique for finding out whether an abnormality on a physical examination or an imaging test is invasive cancer and, if so, what the cancer biomarkers are, such as hormone receptor status (ER, PR) and HER2 status. Biomarkers, sometimes called tumor markers, are substances in a person's blood, urine, or other body fluids that can also be found in or on the tumor.

• **Surgical biopsy.** This type of biopsy removes the largest amount of tissue. Because surgery is best done after a cancer diagnosis has been made, a surgical biopsy is usually not the recommended way to diagnose breast cancer.

• **Image-guided biopsy.** During this procedure, a needle is guided to the location of the mass or calcifications with the help of an imaging technique, such as mammography, ultrasound, or MRI.

• **Sentinel lymph node biopsy.** When cancer spreads through the lymphatic system, the lymph node or group of lymph nodes the cancer reaches first is called the "sentinel" lymph node. The sentinel lymph node biopsy procedure is a way to find out if there is cancer in the lymph nodes near the breast..

Blood tests

These tests may be done before or after surgery.

• **Complete blood count**. A complete blood count (CBC) is used to measure the number of different types of cells, such as red blood cells and white blood cells, in a sample of a person's blood. It is done to make sure that your bone marrow is functioning well.

• **Blood chemistry**. This test evaluates how well your liver and kidneys are working.

• **Hepatitis tests**. While not currently the standard of care, these tests are occasionally used to check for evidence of prior exposure to hepatitis B and/or hepatitis C. If you have evidence of an active hepatitis B infection, you may need to take a special medication to suppress the virus before you receive chemotherapy.

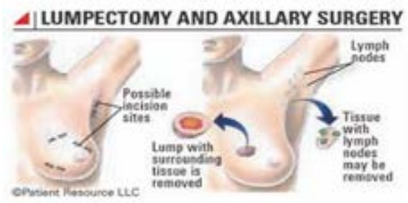
Treatment

For cancer treatment such as surgery, radiation oncology, and medical oncologist work together with radiologists and pathologists to create a patient's overall treatment plan that combines different types of treatments. This is called a multidisciplinary team, sits in Tumor Board where the decision is taken related to further treatment planning.

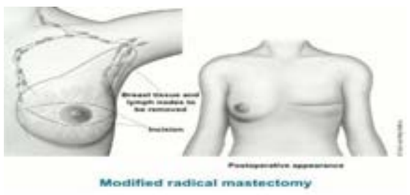
Surgery

Surgery is the removal of the tumor and some surrounding healthy tissue during an operation. Surgery is also used to examine the nearby axillary lymph nodes, which are under the arm. The types of surgery for breast cancer include the following:

• **Lumpectomy.** This is the removal of the tumor and a small, cancer-free margin of healthy tissue around the tumor. Most of the breast remains. A lumpectomy may also be called breast-conserving surgery, a partial mastectomy, quadrantectomy, or a segmental mastectomy.



• **Mastectomy.** This is the surgical removal of the entire breast. There are several types of mastectomies. The skin can be preserved, called a skin-sparing mastectomy, or whether the nipple can be preserved, called a nipple-sparing mastectomy or total skin-sparing mastectomy.



Lymph node removal, analysis, and treatment

Cancer cells can be found in the Axiliary lymph nodes in some cancers. Knowing whether any of the lymph nodes near the breast contain cancer can provide useful information to determine treatment and prognosis.

• **Sentinel lymph node biopsy**:- In a sentinel lymph node biopsy (also called a sentinel node biopsy or SNB), the surgeon finds and removes 1 to 3 or more lymph nodes from under the arm that receive lymph drainage from the breast. The smaller lymph node procedure helps lower the risk of several possible side effects. Those side effects include swelling of the arm called lymphedema, numbness, and arm movement and range of motion problems with the shoulder.

• **Axillary lymph node dissection**:- In an axillary lymph node dissection, the surgeon removes many lymph nodes from under the arm. These are then examined for cancer cells by a pathologist. The actual number of lymph nodes removed varies from person to person.

Reconstructive (plastic) surgery

Women who have a mastectomy or lumpectomy may want to consider breast reconstruction. This is surgery to recreate a breast using either tissue taken from another part of the body or synthetic implants. Reconstruction is usually performed by a plastic surgeon. A person may be able to have reconstruction at the same time as the mastectomy, called immediate reconstruction. They may also have it at some point in the future, called delayed reconstruction.For patients having a lumpectomy, reconstruction may be done at the same time to improve the look of the breast and to make both breasts look similar. This is called oncoplastic surgery.

The techniques discussed below are typically used to shape a new breast.

• **Implants**:-A breast implant uses saline-filled or silicone gel-filled forms to reshape the breast. The outside of a saline-filled implant is made up of silicone, and it is filled with sterile saline, which is salt water. Silicone gel-filled implants are filled with silicone instead of saline. They were thought to cause connective tissue disorders, but clear evidence of this has not been found. Before having permanent implants, a woman may temporarily have a tissue expander placed that will create the correct sized pocket for the implant. Implants can be placed above or below the pectoralis muscle.

External breast forms (prostheses)

An external breast prosthesis or artificial breast form provides an option for women who plan to delay or not have reconstructive surgery. These can be made of silicone or soft material, and they fit into a mastectomy bra. Breast prostheses can be made to provide a good fit and natural appearance for each woman.

Radiation therapy

Radiation therapy is the use of high-energy x-rays or other particles to destroy cancer cells. A doctor who specializes in giving radiation therapy to treat cancer is called a radiation oncologist. There are several different types of radiation therapy:

• **External-beam radiation therapy**. This is the most common type of radiation treatment and is given from a machine outside the body. This includes whole breast radiation therapy and partial breast radiation therapy, as well as accelerated breast radiation therapy, which can be several days instead of several weeks.

• **Intra-operative radiation therapy.** This is when radiation treatment is given using a probe in the operating room.

• **Brachytherapy**. This type of radiation therapy is given by placing radioactive sources into the tumor.

Radiation therapy may be given after or before surgery:

• **Adjuvant radiation therapy** is given after surgery. Most commonly, it is given after a lumpectomy, and sometimes, chemotherapy. Patients who have a mastectomy may or may not need radiation therapy, depending on the features of the tumor. Radiation therapy may be recommended after mastectomy if a patient has a larger tumor, cancer in the lymph nodes, cancer cells outside of the capsule of the lymph node, or cancer that has grown into the skin or chest wall, as well as for other reasons.

• **Neoadjuvant radiation therapy** is radiation therapy given before surgery to shrink a large tumor, which makes it easier to remove. This approach is uncommon and is usually only considered when a tumor cannot be removed with surgery.

Radiation therapy schedule

Radiation therapy is usually given daily for a set number of weeks.

• **After a lumpectomy**. Radiation therapy after a lumpectomy is external-beam radiation therapy given Monday through Friday for 3 to 4 weeks if the cancer is not in the lymph nodes. If the cancer is in the lymph nodes, radiation therapy is given for 5 to 6 weeks.

• **After a mastectomy**. For those who need radiation therapy after a mastectomy, it is usually given 5 days a week for 5 to 6 weeks. Radiation therapy can be given before or after reconstructive surgery. As is the case following lumpectomy, some women may be recommended to have less than 5 weeks of radiation therapy after mastectomy.

• **Proton therapy.** Standard radiation therapy for breast cancer uses x-rays, also called photon therapy, to kill cancer cells. Proton therapy is a type of external-beam radiation therapy that uses protons rather than x-rays. At high energy, protons can destroy cancer cells.

Therapies using medication

Systemic therapy is the use of medication to destroy cancer cells. Medications circulate through the body and therefore can reach cancer cells throughout the body. Systemic therapies are generally prescribed by a medical oncologist, a doctor who specializes in treating cancer with medication.

Common ways to give systemic therapies include an intravenous (IV) tube placed into a vein using a needle, an injection into a muscle or under the skin, or in a pill or capsule that is swallowed (orally).

The types of systemic therapies used for breast cancer include:

• Chemotherapy

• Hormonal therapy

•Targeted therapy

•Immunotherapy

Chemotherapy

Chemotherapy is the use of drugs to destroy cancer cells, usually by keeping the cancer cells from growing, dividing, and making more cells. It may be given before surgery to shrink a large tumor, make surgery easier, and/or reduce the risk of recurrence, called neoadjuvant chemotherapy. It may also be given after surgery to reduce the risk of recurrence, called adjuvant chemotherapy.

A chemotherapy regimen, or schedule, usually consists of a combination of drugs given in a specific number of cycles over a set period of time. Chemotherapy may be given on many different schedules depending on what worked best in clinical trials for that specific type of regimen. It may be given once a week, once every 2 weeks, once every 3 weeks, or even once every 4 weeks. There are many types of chemotherapy used to treat breast cancer. Common drugs include:

• Docetaxel (Taxotere), Paclitaxel (Taxol), Doxorubicin (available as a generic drug),Epirubicin (Ellence), Pegylated liposomal doxorubicin (Doxil), Capecitabine (Xeloda), Carboplatin (available as a generic drug), Cisplatin (available as a generic drug),Cyclophosphamide (available as a generic drug), Eribulin (Halaven), Fluorouracil (5-FU), Gemcitabine (Gemzar), Ixabepilone (Ixempra), Methotrexate (Rheumatrex, Trexall), Protein-bound paclitaxel (Abraxane),

A patient may receive 1 drug at a time or a combination of different drugs given at the same time. Research has shown that combinations of certain drugs are sometimes more effective than single drugs for adjuvant treatment.

Hormonal therapy

Hormonal therapy, also called endocrine therapy, is an effective treatment for most tumors that test positive for either estrogen or progesterone receptors (called ER positive or PR positive;) This type of tumor uses hormones to fuel its growth. Blocking the hormones can help prevent a cancer recurrence and death from breast cancer when hormonal therapy is used either by itself or after chemotherapy.

Hormonal therapy for breast cancer treatment is different than menopausal hormone therapy (MHT). MHT may also be called postmenopausal hormone therapy or hormone replacement therapy (HRT). Hormonal therapies used in breast cancer treatment act as "anti-hormone" or "anti-estrogen" therapies. They block hormone actions or lower hormone levels in the body. Hormonal therapy may also be called endocrine therapy. The endocrine system in the body makes hormones.

Hormonal therapy may be given before surgery to shrink a tumor, make surgery easier, and/or lower the risk of recurrence. This is called neoadjuvant hormonal therapy. When given before surgery, it is typically given for at least 3 to 6 months before surgery and continued after surgery. It may also be given solely after surgery to reduce the risk of recurrence. This is called adjuvant hormonal therapy.

TYPES OF HORMONAL THERAPY

• **Tamoxifen:** Tamoxifen is a drug that blocks estrogen from binding to breast cancer cells. It is effective for lowering the risk of recurrence in the breast that had cancer, the risk of developing cancer in the other breast, and the risk of distant recurrence. Tamoxifen works in women who have been through menopause as well as those who have not.

• **Aromatase inhibitors (AIs):** AIs decrease the amount of estrogen made in tissues other than the ovaries in post-menopausal women by blocking the aromatase enzyme. This enzyme changes weak male hormones called androgens into estrogen when the ovaries have stopped making estrogen during menopause. These drugs include anastrozole (Arimidex), exemestane (Aromasin), and letrozole (Femara). All of the AIs are pills taken daily by mouth. Only women who have gone through menopause or who take medicines to stop the ovaries from making estrogen can take AIs. Treatment with AIs, either as the first hormonal therapy taken or after treatment with tamoxifen, may be more effective than taking only tamoxifen to reduce the risk of recurrence in post-menopausal women. Post-menopausal women with hormone receptor-positive breast cancer can:

Begin hormone therapy with an AI. When an AI is the only hormone therapy given, it's taken for 5 to 10 years.

Begin hormone therapy with tamoxifen and then after a few years, switch to an AI. When an AI is taken after tamoxifen, the drugs are taken for a combined total of 5 to 10 years.

• **Ovarian suppression or ablation.** Ovarian suppression is the use of drugs to stop the ovaries from producing estrogen. Ovarian ablation is the use of surgery to remove the ovaries. These options may be used in addition to another type of hormonal therapy for women who have not been through menopause.

oFor ovarian suppression, gonadotropin or luteinizing releasing hormone (GnRH or LHRH) agonist drugs are used to stop the ovaries from making estrogen, causing temporary menopause. Goserelin (Zoladex) and leuprolide (Eligard, Lupron) are types of these drugs. Since they are not very effective for treating breast cancer on their own, they are typically given in combination with other hormonal therapy. They are given by injection every 4 weeks and stop the ovaries from making estrogen. The effects of GnRH drugs go away if treatment is stopped.

oFor ovarian ablation, surgery to remove the ovaries is used to stop estrogen production. While this is permanent, it can be a good option for women who no longer want to become pregnant, especially since the cost is typically lower over the long term.

Hormonal therapy for women after menopause

Women who have gone through menopause and are prescribed hormonal therapy have several options:

• Tamoxifen for 5 to 10 years

• An AI for 5 to 10 years

• Tamoxifen for 5 years, followed by an AI for up to 5 years. This would be a total of 10 years of hormonal therapy.

• Tamoxifen for 2 to 3 years, followed by 2 to 8 years of an AI for a total of 5 to 10 years of hormonal therapy.

Targeted therapy

Targeted therapy is a treatment that targets the cancer's specific genes, proteins, or the tissue environment that contributes to cancer growth and survival. These treatments are very focused and work differently than chemotherapy. This type of treatment blocks the growth and spread of cancer cells and limits damage to healthy cells.

HER2-targeted therapy

• **Trastuzumab** (FDA-approved biosimilar forms are available). This drug is approved as a therapy for non-metastatic HER2-positive breast cancer. It is given either as an infusion into a vein every 1 to 3 weeks or as an injection into the skin every 3 weeks. Pertuzumab (Perjeta). This drug is approved for stage II and stage III breast cancer in combination with trastuzumab and chemotherapy. It is given as an infusion into a vein every 3 weeks.

• **Pertuzumab**, trastuzumab, and hyaluronidase–zzxf (Phesgo). This combination drug, which contains pertuzumab, trastuzumab, and hyaluronidase-zzxf in a single dose, is approved for people with early-stage HER2-positive breast cancer. It may be given in combination with chemotherapy. It is given by injection under the skin and can be administered either at a treatment center or at home by a health care professional.

• **Neratinib** (Nerlynx). This oral drug is approved as a treatment for higher-risk HER2-positive, early-stage breast cancer. It is taken for a year, starting after patients have finished 1 year of trastuzumab

Bone modifying drugs

Bone modifying drugs block bone destruction and help strengthen the bone. They may be used to prevent cancer from recurring in the bone or to treat cancer that has spread to the bone. Certain types are also used in low doses to prevent and treat osteoporosis. Osteoporosis is the thinning of the bones.

There are 2 types of drugs that block bone destruction:

• **Bisphosphonates.** These block the cells that destroy bone, called osteoclasts.

• **Denosumab** (Prolia, Xgeva). An osteoclast-targeted therapy called a RANK ligand inhibitor. The use of denosumab to lower the risk of breast cancer recurrence is under study.

Immunotherapy

Immunotherapy, also called biologic therapy, is designed to boost the body's natural defenses to fight the cancer. It uses materials made either by the body or in a laboratory to improve, target, or restore immune system function. The following drugs, which are a type of immunotherapy called immune checkpoint inhibitors, are used for recurrent and advanced or metastatic breast cancer. Pembrolizumab is also used for high-risk, early-stage disease.

Recurrent breast cancer

If the cancer returns after treatment for early-stage disease, it is called recurrent cancer. When breast cancer recurs, it may come back in the following parts of the body:

•The same place as the original cancer. This is called a local recurrence.

•The chest wall or lymph nodes under the arm or in the chest on the same side as the original cancer. This is called a regional recurrence.

•Another place, including distant organs such as the bones, lungs, liver, and brain. This is called a distant recurrence or a metastatic recurrence. People with recurrent breast cancer often experience emotions such as disbelief or fear.

Physical, emotional, and social effects of cancer

In general, cancer and its treatment cause physical symptoms and side effects, as well as emotional, social, and financial effects. Managing all of these effects is called palliative care or supportive care.

Palliative care focuses on improving how you feel during treatment by managing symptoms and supporting patients and their families with other, non-medical needs. Any person, regardless of age or type and stage of cancer, may receive this type of care. And it often works best when it is started right after a cancer diagnosis. People who receive palliative care along with treatment for the cancer often have less severe symptoms, better quality of life, and report that they are more satisfied with treatment.Palliative treatments vary widely and often include medication, nutritional changes, relaxation techniques, emotional and spiritual support, and other therapies. Patients receive palliative treatments similar to those meant to get rid of the cancer, such as chemotherapy, surgery, or radiation therapy.

GENERAL ASPECTS OF NURSING CARE

1.Monitor for adverse effects of radiation therapy such as fatigue, sore throat, dry cough, nausea, anorexia.

2.Monitor for adverse effects of chemotherapy; bone marrow suppression, nausea and vomiting, alopecia, weight gain or loss, fatigue, stomatitis, anxiety, and depression.

3.Realize that a diagnosis of breast cancer is a devastating emotional shock to the woman. Provide psychological support to the patient throughout the diagnostic and treatment process.

4.Involve the patient in planning and treatment.

5.Describe surgical procedures to alleviate fear.

6.Prepare the patient for the effects of chemotherapy, and plan ahead for alopecia, fatigue.

7.Administer antiemetics prophylactically, as directed, for patients receiving chemotherapy.

8.Administer I.V. fluids and hyperalimentation as indicated.

9.Help patient identify and use support persons or family or community.

10.Suggest to the patient the psychological interventions may be necessary for anxiety, depression, or sexual problems.

11.Teach all women the recommended cancer-screening procedures.

NURSING CARE PLANS

Providing perioperative nursing care for patients who are to undergo Mastectomy is an integral part of the therapeutic regimen. The nursing goal is to provide support, alleviating anxiety, managing pain, and providing information.

Nursing diagnosis for a patient undergoing Mastectomy:

1.Fear/Anxiety

2.Impaired Skin Integrity

3.Acute Pain

4.Situational Low Self-Esteem

5.Impaired Physical Mobility

6.Deficient Knowledge

7.Risk for Injury

8.Impaired Skin Integrity

9.Activity Intolerance

10.Risk for Ineffective Breathing Pattern

11.Risk for Infection

12.Ineffective Therapeutic Management

13.Risk for Dysfunctional Grieving

14.Ineffective Peripheral Tissue Perfusion

15.Fear

16.Other Possible Nursing Care Plans

1 Fear/Anxiety

Nursing Diagnosis

•Fear

•Anxiety

May be related to

•Threat of death, e.g., extent of disease

•Threat to self-concept: change of body image; scarring, loss of body part, sexual attractiveness

•Change in health status

Possibly evidenced by

•Increased tension; apprehension; feelings of helplessness/inadequacy

•Decreased self-assurance

•Self-focus; restlessness; sympathetic stimulation

•Expressed concerns regarding actual/anticipated changes in life

Desired Outcomes

•Client will acknowledge and discuss concerns.

•Client will demonstrate appropriate range of feelings.

•Client will report fear and anxiety are reduced to a manageable level.

Nursing Interventions	Rationale
Check out and explore what information the patient has about diagnosis, expected surgical intervention, and future therapies. Note presence of denial or extreme anxiety.	Provides knowledge base for the nurse to enable the reinforcement of needed information, and helps identify patient with high anxiety, low capacity for information processing, and need for special attention. Note: Denial may be useful as a coping method for a time, but extreme anxiety needs to be dealt with immediately.
Ascertain purpose and preparation for diagnostic tests.	More understanding of procedures and what is happening increases feelings of control and lessens anxiety.
Implement an ambiance of concern, openness, and availability, as well as privacy for patient and so. Suggest that so be present as much as possible.	Time and privacy are needed to provide support, discuss feelings of anticipated loss and other concerns. Therapeutic communication skills, open questions, listening, and so forth facilitate this process.
Encourage questions and provide time for expression of fears. Tell patient that stress related to breast cancer can persist for many months and to seek help and support.	Provides an opportunity to identify and clarify misconceptions and offer emotional support.
Determine the degree of support available to the patient. Give information about community resources, such as Reach to Recovery, YWCA Encore program. Encourage and provide for a visit with a woman who has recovered from a mastectomy.	Can be a helpful resource when patient is ready. A peer who has experienced the same process serves as a role model and can provide validity to the comments, hope for recovery and normal future.
Consider role of rehabilitation after surgery.	Rehabilitation is an essential component of therapy intended to meet physical, social, emotional, and vocational needs so that the patient can achieve the best possible level of physical and emotional functioning.

2 IMPAIRED SKIN INTEGRITY

Nursing Diagnosis

Impaired Skin Integrity

May be related to

• Surgical removal of skin/tissue; altered circulation, presence of edema, drainage; changes in skin elasticity, sensation; tissue destruction (radiation)

• Disruption of skin surface, destruction of skin layers/subcutaneous tissues

Desired Outcomes

• Client will achieve timely wound healing, free of purulent drainage or erythema.

• Client will demonstrate behaviors/techniques to promote healing/prevent complications.

Nursing Interventions	Rationale
Inspect dressings anteriorly and posteriorly for characteristics of drainage. Monitor amount of edema, redness, and pain in the incision.	Use of dressings depends on the extent of surgery and the type of wound closure. (Pressure dressings are usually applied initially and are reinforced, not changed.) Drainage occurs because of the trauma of the procedure and manipulation of the numerous blood vessels and lymphatics in the area.
Perform routine assessment of involved arm. Elevate hand or arm with shoulder positioned at appropriate angles (no more than 65 degrees of flexion, 45–65 degrees of abduction, 45–60 degrees of internal rotation) and forearm resting on wedge or pillow, as indicated.	Preventing or minimizing edema reduces the discomfort and complications associated with it. Elevation of affected arm facilitates drainage and resolution of edema. Note: Lymphedema is present in about 25% of patients and may develop immediately after surgery or years later.
Monitor temperature.	Early recognition of developing infection can enable the rapid institution of treatment.
Maintain in semi-Fowler's position on the back or unaffected side; avoid letting the affected arm dangle.	Assists with drainage of fluid through use of gravity.
Refrain from measuring blood pressure (BP), injecting medications, or inserting IVs in the affected arm.	Increases potential of constriction, infection, and lymphedema on the affected side.
Observe graft site (if done) for color, blister formation; note drainage from donor site.	Color will be affected by the availability of circulatory supply. Blister formation provides a site for bacterial growth or infection.
Assess wound drains, periodically noting amount and characteristics of drainage.	Drainage of accumulated fluids (lymph, blood) enhances healing and reduces the susceptibility to infection. Suction devices (Hemovac, Jackson-Pratt) are often inserted during surgery to maintain negative pressure in the wound. Tubes are usually removed around the third day or when drainage ceases.
Encourage wearing of loose-fitting or non-constrictive clothing. Tell patient not to wear a wristwatch or other jewelry on affected arm.	Reduces pressure on compromised tissues, which may improve circulation and healing and minimize lymphedema.
Carry out antibiotics as indicated.	May be given prophylactically or to treat specific infection and enhance healing.

3 DEFICIENT KNOWLEDGE

Nursing Diagnosis

• Deficient Knowledge

May be related to

• Lack of exposure/recall

• Information misinterpretation

Desired Outcomes

• Client will verbalize understanding of disease process and potential complications.

• Client will perform necessary procedures correctly and **explain reasons for actions.**

• Client will initiate necessary lifestyle changes and participate in the treatment regimen.

Nursing Interventions	Rationale
Review disease process, surgical procedure, and future expectations.	Provides knowledge base from which patient can make informed choices, including participation in radiation and chemotherapy programs.
Have patient demonstrate care of drains and wound sites.	Shorter hospital stays may result in discharge with drains in place, requiring more complex care by patient or caregivers. Drains may be removed 7–10 days after surgery.

Nursing Interventions	Rationale
Encourage continuation of exercises, increasing program as healing progresses, for at least a year.	Enhances development of collateral lymphatic channels, reduces the tightening of scar tissue, and maintains muscle strength and function. Note: Moderation is important because strenuous activity and exercise increases heart rate and body temperature, which can potentially increase edema.
Discuss necessity for well-balanced, nutritious meals and adequate fluid intake.	Provides optimal nutrition and maintains circulating volume to enhance tissue regeneration and healing process.
Suggest alternating schedule of frequent rest and activity periods, especially in situations when sitting or standing is prolonged.	Prevents or limits fatigue, promotes healing, and enhances feelings of general well-being. Positions in which arm is dangling and extended intensify stress on affected structures, creating muscle tension and stiffness, and may interfere with healing.
Instruct patient to protect hands and arms by wearing long sleeves and gloves when gardening; use thimble when sewing; use potholders when handling hot items; use plastic gloves when doing dishes; avoid lifting or moving heavy objects; and do not carry a purse or wear jewelry and wristwatch on the affected side.	Compromised lymphatic system causes tissues to be more susceptible to infection or injury, which may lead to lymphedema.
Demonstrate holding affected arm appropriately by not dangling the arm, swinging arms with elbows bent when walking, placing arm above heart level when sitting or lying down.	Helps prevent or minimize lymphedema and “frozen shoulder.”
Warn against having blood withdrawn or receiving IV fluids, medications or BP measurements on the affected side.	May restrict the circulation and increase the risk of infection when the lymphatic system is compromised.
Recommend wearing of a medical identification device.	Prevents unnecessary trauma (BP measurements, injections) to affected arm in emergency situations.
Suggest gentle massage of the healed incision with emollients.	Stimulates circulation, promotes elasticity of the skin, and reduces discomfort associated with phantom breast sensations.
Recommend use of sexual positions that avoid pressure on the chest wall. Encourage alternative forms of sexual expression (cuddling, touching) during the initial healing process while operative area is still tender.	Promotes feelings of femininity and sense of ability to resume sexual activities.
Encourage regular self-examination of remaining breast. Determine the recommended schedule for mammography.	Identifies changes in breast tissue indicative of recurrent or new tumor development.
Identify signs and symptoms requiring medical evaluation (breast or arm red, warm, and swollen; edema, purulent wound drainage; fever or chills).	Lymphangitis can occur as a result of infection, causing lymphedema.

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03

IMPACT OF EFFECTIVE COMMUNICATION BETWEEN RADIOTHERAPY TECHNOLOGIST & PATIENT IN TREATMENT RELATED PAIN & PROCEDURAL DISCOMFORT DURING RADIOTHERAPY.

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INTRODUCTION

Radiotherapy Technologist (RTT) strives to deliver reproducible treatment by carefully positioning and immobilizing patients daily during the month long course of treatment; patients, however, might find this process distressing. Assuming an average visit of patient receiving external beam radiation therapy lasts approximately 10 to 30 minutes, this equates to approximately 100 to 150 minutes per week of immobilization. Patients who suffer from psychosocial stress, such as claustrophobia or general anxiety, maintaining position during a simulation and treatment session can be challenging. Effective Communication has an important role in radiation therapy profession, especially in the treatment room. Establishing effective communication among the RTT team and patient reduces medical errors, improve treatment outcomes, and enhances patient safety and care. Highlighting lessons which can strengthen communication skills amongst RTT and patients is important. Independent research has demonstrated repeatedly that interaction between RTT and patient can significantly affect patient satisfaction with care received, treatment adherence, and anxiety reduction.

ENHANCING NONVERBAL COMMUNICATION IN THE TREATMENT ROOM

Verbal communication is the use of words to convey a message either spoken or written. With verbal communication amongst the RTT team, team members can coordinate necessary information amongst each other that
aids in patient setup, positioning and documentation, thus reducing medical errors and radiation accidents during treatment delivery. Many RTT use general terms or phrases such as, pull shoulder up or down, roll, pitch, remove neck fats, chin up or down, relax body, hips or chest to me, as instruction for their team to help position the patient. While communicating amongst team member in the treatment delivery room, RTT must be conscious of the patient's perception. Patients may overhear the words and may develop unnecessary anxiety. Therefore, RTT should communicate with team members using language that is not alarming to the patient. For example RTT should avoid “I am on the wrong tattoo”, “I keep wrong head rest “or “this setup is not good”. Although a message between RTT is not directed at the patient, the team must be mindful to the patient's perspective and their interpretation of the statement. One of the simplest ways to avoid a problem during a simulation and treatment session is to communicate clearly and succinctly. Radiation therapy terminology can be confusing so RTT should use simple language that will not increase patient's anxiety. Assisting patients with their concerns helps them develop a sense of self-worth and trust in their care givers.

ENHANCING NONVERBAL COMMUNICATION IN THE TREATMENT ROOM

Nonverbal communication is the use of physical action to convey a message. Communication can be nonverbal in up to 90% of interaction. Nonverbal communication can act as a substitute for verbal communication or complement a message relayed orally. While using nonverbal communication in the treatment room with your colleague or with other health care member, the most important aspects of communicating nonverbally include eye contact, tone of voice, body posture, and facial expression. Learning to communicate with your colleague through nonverbal cues is as important as

communicating verbally. If a colleague takes control of the couch, RTT understands that their role is to manipulate the patient's body, if RTT is helping the patient off the table and to the changing room, the partnering technologist should bring the gantry to 0 and prepare the room for the next patient. Nonverbal cues between partners, such as eye gazes and hand motions, can facilitate patient setup in scenarios where patients are anxious about treatment. For example, if a partner makes a shift and the table does not clear laterally, a RTT should not say "the table does not clear the gantry and is going to hit the patient". Instead, the RTT should get their partner's attention by discreetly pointing to the couch parameters. Using nonverbal cues is an effective way to communicate. It can reinforce and replace spoken communication amongst RTT during the treatment session.

Enhancing Communication with Patients

Effective communication can greatly affect the success of treatment delivery and patient experience. Proper communication begins with an introduction. While meeting patients, RTT must present themselves with confidence, professionalism, neat attire, and positive body language. A goal of patient care is to establish trust with patients that make them feel they are being safely cared for throughout their treatment. After the introduction the patient should receive information about the simulation and treatment appointment. RTT should use clear and concise language. During treatment, guiding patients through positions and providing them with sensory information might help them feel more relaxed and comfortable and lead to more efficient and accurate setups. A patient body language can provide information to the technologist as well. In some instances, patients do not express their emotions verbally, but their body language indicates what they are feeling. For example, a patient with Head and Neck cancer might experience anxiety and appear to be breathing heavily on the table before their mask or orfit is placed. As RTT identifying patient's behaviors is vital because technologist interact with patient daily. As a patient goes through their treatment, the RTT is likely to establish deeper relationship that allows recognizing early signs and symptoms of discomfort to the patient.

CONCLUSION

The radiation therapy treatment room requires effective communication between radiotherapy technologist and patients. Understanding how verbal and nonverbal communication can enhance patient safety and daily care and helps in avoiding major radiotherapy accidents. Working as a team and clear communication enhance patient experience and treatment outcomes. Novice radiotherapy technologist should work to enhance their communication skill to provide optimal patient care.

04

CHORIOCARCINOMA INDUCED THYROTOXICOSIS

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ABSTRACT

Paraneoplastic hyperthyroidism, although uncommon, is a known phenomenon in Germ cell tumors. Trophoblastic thyroidian hyperfunction is a complication of Choriocarcinoma.

Choriocarcinoma is associated with high levels of Human Chorionic Gonadotropin (HCG). HCG is a glycoprotein produced by the placenta. It is structurally almost identical to Thyroid Stimulating Hormone (TSH). At high levels, HCG can stimulate the TSH receptor causing Hyperthyroidism.

We present a case of a 25 year old female, diagnosed with metastatic Choriocarcinoma and concomitant Hyperthyroidism.

After the first cycle of chemotherapy, the concentration of HCG decreased significantly. Simultaneously, patient's thyroid function test values normalized dramatically and the patient became euthyroid.

The two known causative mechanisms are, enhanced thyrotropic activity by HCG and the structural similarity between HCG and TSH which causes release of Thyroxine from the thyroid gland.

Key words: HCG(Human chorionic gonadotropin), TSH (Thyroid stimulating hormone), GTN (Gestational trophoblastic neoplasm), Choriocarcinoma, Hyperthyroidism.

INTRODUCTION AND REVIEW OF LITERATURE :

Choriocarcinoma is a malignant disease arising from the placenta and trophoblastic villi. Gestational trophoblastic neoplasia (GTN) occur in 1 : 40,000 pregnancies and are more common in South East Asia as compared to Europe and North America.

Invasive mole and Choriocarcinoma are the most common GTN, producing high levels of HCG and are known to be responsive to chemotherapy.

HCG is used as a marker for diagnosis, monitoring the therapy and follow up of these patients.

HCG is a glycoprotein produced by placenta and has an intrinsic thyroid stimulating activity.1

Structural resemblance of TSH and HCG causes release of Thyroxine from the thyroid gland.

The first case of Hydatidiform mole and Thyrotoxicosis was reported in 1955 by Tisne and colleagues. 2

Since then several cases of Gestational trophoblastic disease induced Hyperthyroidism have been reported in literature.3-8

CASE DESCRIPTION:

A 25 year old female,diagnosed case of GTN (Choriocarcinoma) was admitted to our tertiary cancer care centre for chemotherapy and supportive care.

CASE HISTORY:

Patient was G2P0A1 (Obstretic score). She had history of one abortion more than a year back. No other details were available. She presented to us with complaints of pain in abdomen, bleeding per vaginum(PV) and breathlessness.

GENERAL EXAMINATION:

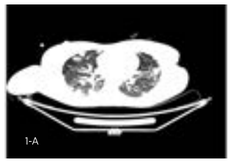
- General condition was moderate.

- Patient was afebrile.
- Pulse 142/min, BP 110/70,
- Respiratory rate 20/min,
- SpO2 98 % on room air.

SYSTEMIC EXAMINATION :

Cardiovascular(CVS) and Central Nervous System(CNS) examination were normal.

RADIOLOGICAL INVESTIGATIONS REVEALED :



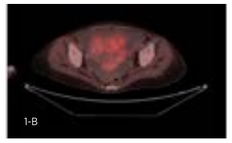


Figure 1 (A) CT lung : Extensive bilateral metastatic nodules in lung parenchyma.

Figure 1 (B) PET- CT : Hypermetabolic, heterogeneously enhancing solid cystic mass lesion involving the uterus and cervix. (Site of primary malignancy)

CT Brain : Normal. No evidence of metastasis.

BLOOD INVESTIGATIONS REVEALED :

Serum Beta-HCG level was 6,88,748 mIu/ml (Normal range: 0 to 10 mIu/ml).

Thyroid function tests showed Serum T3 to be 6.30 nmol/l(Normal range: 0.92 to 2.33 nmol/l).

Serum T4 was 975 nmol/l (Normal range: 62 to 120 nmol/l).

Serum TSH was less than 0.25 ulu/ml (Normal range: 0.25 to 5.00 ulu/ml).

Other Haematological and Biochemical parameters like Complete Blood Count(CBC), Kidney function tests (KFT) and liver function tests (LFT) were all within normal limits.

DIAGNOSIS :

Prognostic scoring index for GTN (NCCN guidelines version 3.2020)was used for risk stratification(Low risk < 7 , High risk > 7).

Patients score was 12 (high risk)

Burch Wartofsky point scale was used for clinical assessment of thyroid storm.

Interpretation : score < 25 storm unlikely, 25 to 45 impending thyroid storm, > 45 thyroid storm

Patients Score was 35 – Impending thyroid storm

Diagnosis: Gestational trophoblastic neoplasam (Choriocarcinoma ,High Risk FIGO grade III) with pulmonary metastases and Hyperthyroidism (Impending Thyroid storm).

TREATMENT ASPECT :

Chemotherapy was started : EMACO Day 1 and Day 8, 6 cycles.

Patient had Biochemical as well as Clinical Hyperthyroidism. Burch- Wartofsky score for patient was 35 which indicated impending thyroid storm.

Patient was put on Neomercazol 5 mg BD.

Other supportive care was initiated.

Patients Beta-HCG levels were monitored weekly. There was marked decline in serum BHCG levels. At one month, Beta-HCG was 711 mIu/ml and TFT normalized. T3 was 2.0 nmol/l, T4 was 101 nmol/l and TSH was 1.80 ulu/ml. (Neomercazol was stopped at one month)

Six cycles of EMACO were given. Sr BHCG levels normalized.

Patient was monitored on monthly basis for serum B HCG levels.

At one year follow up, Patients Beta-HCG level was 0.3 mIu/ml.

Patient was Euthyroid without any anti thyroid medication and doing well.

Summary of HCG, TFT measurements

Test	Ref.Values	At presentation	One month	Six months	One year
B-HCG	0 to 10 mIu/ml	6,88,748	711	130	0.3
TSH	0.25 to 5.00 ulu/ml	Less than 0.25	1.80		1.14
T3	0.92 to 2.33 nmol/l	6.30	2.00		1.2
T4	62 to 120 nmol/l	975	101		66
FT3	2.30 to 4.20 pg/ml				3.26
Ft4	0.89 to 1.76 ng/dl				0.81
Anti Thyroid Treatment		Neomercazole 5 mg BD	Neomercazole 5 mg BD	Without Neomercazole	Without Neomercazole

DISCUSSION :

Choriocarcinoma is the most aggressive form of GTN, characterized by vascular invasion and wide spread metastases. The most common metastatic sites are lung (80 %), vagina (30 %) brain (10 %) and liver (10 %).9

The pathophysiology of thyroid disease in GTN is related to the secretion of HCG from the trophoblastic tissue. The effect of HCG on thyroid gland is thought to occur due to molecular mimicry between HCG and TSH.

The two known mechanisms are increased thyrotropic activity by HCG and structural resemblance with TSH causing release of thyroxine from thyroid gland.10

Cave and colleagues 11 examined serum from patients with metastatic choriocarcinoma. By using gel filtration, a single peak coinciding with HCG was demonstrated. This suggested that the thyrotropin of choriocarcinoma was HCG. The similarity in structure between HCG and TSH can cause cross reactivity of each receptor.

Various studies have shown prevalence of hyperthyroidism with high levels of HCG. Lockwood et al found suppressed TSH in 100 % specimen with HCG concentration > 40,000 Iu/l 12. Glinoer estimated that any increase 10,000 Iu/l for HCG will be followed by increase in FT4 by 0.1 ng/dl and reduction in TSH by 0.1 mIu/ml. 13 -15

Although there is no precise threshold at which HCG causes Thyrotoxicosis, thyroid function should be measured in all patients with HCG > 50,000 Iu/L regardless of the cause of elevation. 16,17

Choriocarcinoma is sensitive to chemotherapy and choice of regimen is based on WHO (World Health Organisation)Prognostic Scoring System and the International Federation of Gynecology and Obstetrics(FIGO) anatomic staging system.

In patients having Biochemical and Clinical Hyperthyroidism, Burch- Wartofsky score should be assessed for presence of Thyroid storm and treatment should be initiated accordingly. Unless there are symptoms of severe thyrotoxicosis, treatment of hyperthyroidism is not needed, as chemotherapy for Choriocarcinoma should effectively bring down the HCG levels alleviating the hyperthyroidism.

CONCLUSION :

Choriocarcinoma is not only associated with Hyperthyroidism but also can induce thyroid storm.

High levels of HCG are directly proportional to the clinical manifestation of Hyperthyroidism.

Thyroid function must be measured in all patients with HCG levels > 50,000Iu/L.

In patients having Biochemical and clinical hyperthyroidism, Burch- Wartofsky score should be assessed for presence of Thyroid storm and treatment should be initiated accordingly.

Unless there are symptoms of severe thyrotoxicosis, Treatment of hyperthyroidism is not initiated.

Thyroid function is expected to return to normal once the HCG levels come down.

Awareness of this condition is important for diagnosis and treatment.

CPC : CAPSULE

• What makes the presentation of this disease reportable ?

Patients of GTN can develop hyperthyroidism or Thyroid Storm which can be a life threatening complication.

• What is the major learning point ?

GTD induced thyroid storm should be considered in any female of child bearing age with signs and symptoms of Thyrotoxicosis.

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05

Mask anxiety: A significant but manageable problem during radiotherapy in head and neck cancer patients

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ABSTRACT

Radiotherapy (RT) is frequently prescribed for Head and Neck cancer patients. Current radiotherapy technique includes preparation of thermoplastic mask before actually delivering the treatment to immobilize the body parts where the radiotherapy is being given. This is done to increase the accuracy and preciseness of treatment. Some patients may develop anxiety to this mask and this 'mask anxiety' may make them hesitant to undergo the RT or avoid it completely, hampering the further course of the treatment. Author proposes some recommendations to deal with this problem.

Key words- radiotherapy, mask anxiety, head and neck cancer

INTRODUCTION

Cancers of head and neck region are common malignancies found worldwide, though Asian population bears major burden. [1] In India, head and neck cancers (HNC) are emerging as a major public health problem with prevalence of around 30% of all the cancers in male population. [2] Treatment includes surgery, radiotherapy or/and chemotherapy depending on the clinical profile of the patient. Commonly utilized External beam radiation therapy (EBRT) involves delivering the radiation via machine that emits x-ray to the cancer lesion. Therapy requires certain procedures like simulation to determine the treatment fields, making tattoos, preparation of mask to immobilize the patient so that radiation can be given more accurately and exactly at the lesion site to be followed by actual therapy. The simulation room, radiotherapy cabin and a machine delivering the radiation all are like a closed chamber. Many patients develop anxiety, distress and claustrophobia before/during the procedure. [3] A thermoplastic mask is used to immobilize the patient to ensure a precise RT delivery to the sites of cancer. [4] Some patients may experience acute anxiety during the procedure, which can affect the accuracy and precision of delivering RT for HNC. [5] This mask anxiety (different from claustrophobia, which is a fear of closed spaces) can be troublesome for many patients who may not be ready for RT session, affecting their further cancer treatment. Mask anxiety can occur as a separate entity, or along with claustrophobia. Though it's not mentioned in any diagnostic criteria, it can be categorized under 'specific phobias'. Usual symptoms of mask anxiety are feeling of suffocation when the mask is applied, palpitation, sweating, restlessness, panic like state, intense fear and desire to remove the mask. Some authors have suggested 'open face' thermoplastic mask for immobilization of the head to ease mask anxiety & claustrophobia, improve comfort, and is considered as a superior alternative to a standard full-head mask. [6] Psycho-social interventions are highly useful to alleviate mask anxiety in these patients.

Some authors described that HNC patients undergoing RT have increased levels of stress, anxiety & claustrophobia. Identifying and treating these issues is important as they may significantly affect treatment acceptance, tolerability and quality of life during and after the treatment. [7] This raises a question of what can be done to prevent the mask anxiety as radiation therapy is an integral part of the treatment of head and neck cancers.

Some recommendations that can be utilized are as follows.

BEFORE THE THERAPY-

1) Adequate education of a patient about the treatment procedure, frequency of radiation, advantages & adverse effects. Demonstration of mask preparation & application can be of great help.

2) Assessing the readiness of patient to undergo the therapy and helping him/her to make a decision.

3) Psychiatric evaluation for any predisposing factor or already diagnosed psychiatric disorder so as to address and treat it beforehand. Studies show that up to 1/3rd of the patients treated with RT have some unmet psycho social needs regarding information, communication, emotional and spiritual support, involvement of family and management of physical symptoms. [8] These needs should be catered for the better outcome

DURING THE MASK PREPARATION

1) Reassurance of patients about safety of the procedure and telling them the importance of immobilization.

2) Cutting the portion of mask (if possible) that is not needed or less needed to make it more comfortable for the patient if he/she becomes anxious. Mask can be cut open around the eyes and mouth for patients' comfort. (but mask cutting after moulding is difficult, may produces sharp edges, and not found to be helpful to patients of claustrophobia) [6]

3) Using other methods of immobilization can also be done.

IF ANXIETY PERSISTS AFTER

THE PROCEDURE

1) Psychiatric management including relaxation therapy, medicines on 'as and when needed' basis to alleviate the anxiety and counselling.

2) Teaching them how to perform self-relaxation during the procedure in subsequent sessions.

CONCLUSION

Mask anxiety can be troublesome for patients of head and neck cancer and need to be addressed and intervened immediately for better management of patient. Psychiatric evaluation can be considered as an integral aspect of treatment in patients before undergoing radiotherapy.

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06

FLASH - RADIOTHERAPY

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Radiotherapy has been used for several decades to treat cancer. The intensive research in the field of radiotherapy has enabled it as a powerful and precise weapon in the treatment of cancer. The efficiency of conventional RT is limited by the damages caused to normal healthy tissue. FLASH Radiotherapy (RT) is a novel radiotherapy technology using single fraction of ultra-high dose-rate radiotherapy (≥ 40 Gy/s), a several magnitude higher than conventional dose rate 0.05Gy/s) radiotherapy generating a phenomenon known as the "FLASH effect".The Flash effect is absence of normal tissue toxicity at doses it occurs at conventional dose rate RT while maintaining tumour control.

HISTORY OF FLASH RADIOTHERAPY :

FLASH RT was first reported by Dewey and Boag in 1959. Ultra high dose rate 1.5-MV X-rays were used to irradiate a bacterium, Serratia Marcescens, which showed lower radiosensitivity with ultra-high dose rate as compared to conventional dose rate suggesting that ultra-high dose-rate irradiation can protect bacteria when compared to conventional dose-rate irradiation (1). It was rediscovered by Favaudon et al in 2014, using FLASH-RT to treat mice lung tumors that can lead to a complete response and reduce the early and late toxicity affecting normal lung tissue (2). Series of preclinical studies in vivo have shown dramatically sparing effect of FLASH RT on normal tissue while preserving anti-tumour effect (3).To date, a single patient has been treated with FLASH radiotherapy for the treatment of subcutaneous T-cell lymphoma resulting in complete response and minimal toxicities (4).

MECHANISM OF FLASH RT

The biological mechanism of FLASH-RT is very complex. As compared to Conv RT, FLASH have differential responses on healthy tissues and tumor cells. In Past multiple theories and hypothesis were suggested to explain the mechanism of FLASH RT. When compared to conventional dose rate RT, FLASH RT can induce the protection of normal cells through transient hypoxia. and solid tumors are hypoxic so they will not be protected from transient hypoxia.(1). The oxygen depletion hypothesis seems to explain the reduced toxicity of FLASH-RT to normal tissue. Another theory is that the number of DNA damage sites with FLASH-RT is lessthan that following conventional dose-rate irradiation. FLASH-RT causes radiation with short pulses leading to fewer late side effects in healthy tissue also less exposure of circulating lymphocytes and improved immune response (5, 6). Also myosin light chain activation plays an important role in different biological effects between FLASH-RT and conventional dose-rate irradiation (7). Differential responses of FLASH RT between healthy and tumor tissues may be due to the different types of DNA damage and their differences in abilities to scavenge hydrogen peroxide products. (8, 9, 10).

MAIN APPLICATION OF FLASH RT:

1. **Tumour Control:** Allow for escalation of total dose in the treatment of radioresistant tumors by increasing therapeutic index.

2. **Sparing of normal tissue:** Radioresistance of healthy normal tissue to FLASH RT due to generation of less reactive oxygen species

INFLUENCE OF FLASH RT ON RADIOTHERAPY:

FLASH-RT may potentially change the traditional theories of 5 R's of radiobiology. Unlike conventional RT, FLASH RT is related to only DNA repair and intrinsic radiosensitivity as the delivery time of FLASH-RT is too short for reoxygenation, repopulation, and redistribution to occur. It may increase the tolerance of healthy tissue by

changing α/β value. As it is performed only once for a very short time, concurrent chemo-radiotherapy is not possible; only neoadjuvant and adjuvant chemotherapy can be administered.

If FLASH-RT technology is used in clinical practice single fraction radiotherapy will be widely used to replace the current multiple fractions of radiotherapy.

FUTURE :

Presently there is lack of consistency between variables that could potentially influence the induction of the FLASH effect such as dose rate, total dose, pulse rate, fractionation, modality and source of radiation. So appropriately powered, randomized controlled trial with FLASH RT and CONV-RT arms would be required to definitively show whether FLASH-RT is associated with superior clinical outcome.

There is need to redefine definitive irradiation doses and also requirement of modified irradiation system with function of multipal-field conformal radiation therapy and multi mechanical Gantry

UPCOMING IS FLASHKNIFE:

FLASHKnife is being developed with the aim of bridging the gap from preclinical to clinical practice using very High energy electrons (50-250 MeV) preferably 6, 8, 10, and 12 MeV. Flashknife has 8 degree of freedom with automated image guided docking.

CONCLUSION:

FLASH-RT has the potential to significantly improve radiotherapy treatments, not only by increasing the therapeutic ratio, but also by bringing new possibilities such as motion management, faster treatments, or new treatment. Although the FLASH effect in theory appears revolutionary, however translation into the clinic is still difficult due to several hurdles including the need for a better understanding of the biological mechanisms, optimization of parameters and technological challenges, therefore more experiments are needed before clinical application. As such there are no real downside with FLASH RT, only need is to work on technical challenges. So it may take many years before FLASH-RT becomes a mainstay radiotherapy technology in clinical applications.

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FLASH KNIFE

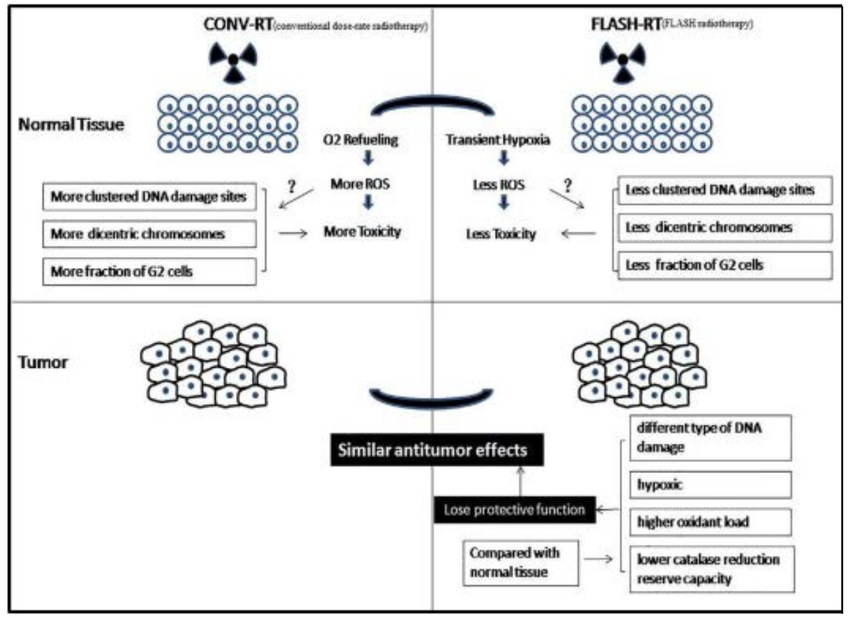

Figure 1:
Mechanism and Differential responses of Conventional and FLASH RT on normal and healthy tissues

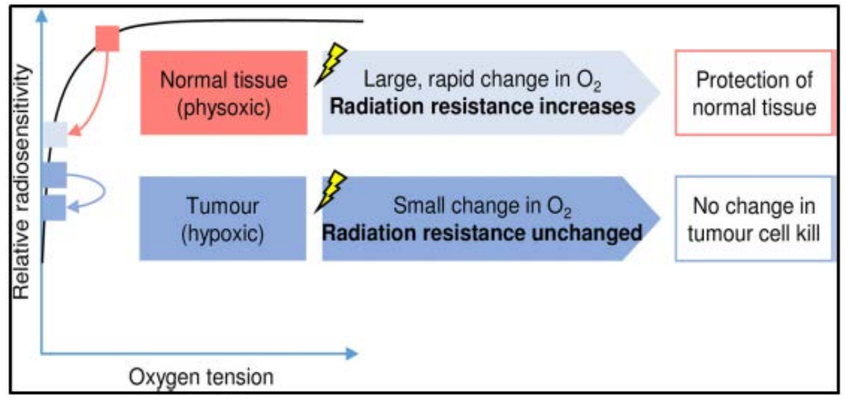

FIGURE 2 |

The oxygen depletion hypothesis. The relationship between oxygen tension (horizontal axis) and radiation sensitivity (vertical axis) is shown schematically and has been widely reported (40, 41). In response to FLASH-RT, the physiological level of oxygen(physoxic) found in normal tissues decreases rapidly (pink arrow) and has an important impact on radiation sensitivity. This temporary or transient hypoxia protects the normal tissues as radiation resistance increases. In contrast, oxygen levels are low (hypoxic) in tumor tissues and consequently FLASH-RT has less of an impact on radiation sensitivity.

07

Feasibility and safety of cytoreductive surgery and HIPEC for advanced epithelial ovarian cancer

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INTRODUCTION

We have entered a new era of treatment for women diagnosed with ovarian cancer. May it be advancements in targeted molecular therapy, advancements in surgeries or interest in the use of various types of intraperitoneal chemotherapy.

The use of heated intraperitoneal chemotherapy (HIPEC) has gained popularity in recent years, even more so since the first randomised controlled trial (RCT) of HIPEC for the treatment of primary advanced ovarian cancer (OVHIPEC 1) was published in January 20181. This study showed an almost 12 month improved overall survival (OS) in women who received a single 90-min dose of heated intraperitoneal (IP) Cisplatin at the time of interval cytoreductive surgery. Central radiologically-assessed recurrence-free survival analysis of this trial published recently confirmed the benefit of adding HIPEC2. This was done to rule out radiological bias caused by the open-label nature of the study. Cumulative incidence of peritoneal recurrence was lower after surgery+HIPEC, but there was no difference in extraperitoneal recurrences. Those were impressive results from a one-off treatment that can be given at the time of surgery, and therefore has in-tense appeal to oncological surgeons.

Another RCT from South Korea published this year, on a subgroup analysis showed that the addition of HIPEC to interval cytoreductive surgery provided an improvement in progression-free and overall survival3. This improvement in survival was almost similar as to what was observed in OVHIPEC 1 study.

WHAT IS HIPEC AND HOW DOES IT WORK?

The peritoneal cavity is located between the parietal peritoneum (surrounding the abdominal wall) and visceral peritoneum (surrounding the internal organs) and is delineated by the plasma–peritoneal barrier. The existence of this barrier enables intraperitoneal chemotherapy to be cleared much more slowly than systemic chemotherapy, leading to the accumulation of higher local drug concentrations within the peritoneum, as illustrated by differences in the area AUC ratio between chemotherapies delivered via intraperitoneal and those delivered by systemic administration over time4. Multiple methods of administering intraperitoneal therapy exist, of which HIPEC is the most widely used

Hyperthermic intraperitoneal chemotherapy (HIPEC), involving the intra-operative circulation of a heated chemotherapy solution, provides two main advantages: timing (administration when all peritoneal surfaces are exposed) and hyperthermia (which is intrinsically antineoplastic and able to potentiate the efficacy of certain drugs such as cisplatin)[5].

DETAILS OF PROGRAM AND PROTOCOL DEVELOPMENT:

In ovarian cancer, complete CRS (cytoreductive surgery) profoundly changes the prognosis. Recommendations for surgery following primary diagnosis moved from 'optimal debulking'(residual disease with a diameter <1 cm in the largest remaining nodule), to complete CRS.

HIPEC is given immediately following cytoreductive surgery and is most effective when there is no or minimal residual disease. Therefore per se HIPEC is not an individual treatment modality but a continuum of a highly complex and proficiently done surgery which results in minimal residual disease. To provide this kind of surgery safely and competently in all existing gynaecological oncology centres in India, it needs to be further centralised to specialised centres with high level of surgical expertise.

Our peritoneal surface malignancy program for ovarian cancer started in 2017. We gained experience from doing more than 200 cases of extensive CRS and a protocol development was done. The team for management of advanced ovarian cancer at our center is multidisciplinary in nature. The core CRS and HIPEC team comprises of experienced senior gynecologic oncologist, dedicated onco-anesthesia & critical care experts, trained nursing and operation theatre technicians. The support team helps in rehabilitation and postoperative care of the patient and includes members from physiotherapy, nutrition, stoma care, and clinical psychology divisions.

We performed 8 cases of HIPEC between July 2019-July 2022. During this period of 3 years the cases were not uniformly distributed and there was a gap of more than 2 years between the first and second case owing to COVID pandemic and related logistic issues.

RESULTS:

All the 8 cases were stage IIIC advanced epithelial ovarian cancer who received 3 cycles of NACT as per standard protocol for ovarian cancer.

High grade serous adenocarcinoma was present in seven patients while moderately differentiated endometroid adenocarcinoma in one patient. Patients were with good performance status and belonged to the age group of 39-58 years. All were CC0 Resections. Peritoneal Carcinoma Index (PCI) ranged between 12-24, median being 18.

Procedures required to achieve CC0 resections apart from standard procedures that is total abdominal hysterectomy, bilateral adnexectomy, total omentectomy and retroperitoneal lymph node debulking were as follows,

- Total Parietal Peritonectomy - 4
- >3 Peritonectomies - 4
- Liver surface deposit excision - 6
- Bowel surface deposit excision - 7
- Mesenteric serosa excision - 2
- Splenectomy - 2
- Cholecystectomy - 1
- Appendectomy - 1
- Total Proctocolectomy - 1

In one patient stoma was created.

All the planned patients for CRS with HIPEC could undergo entire cycle of HIPEC after complete cytoreduction. We used open technique for HIPEC. Intraperitoneal Cisplatin at a dose of 80mg/m2 was used at a temperature of around 42C for a duration of 90min.

Blood loss ranged between 550 -1200ml with a median blood loss of 750ml.

Duration of surgery ranged between 420min-630min with median duration of 450min.

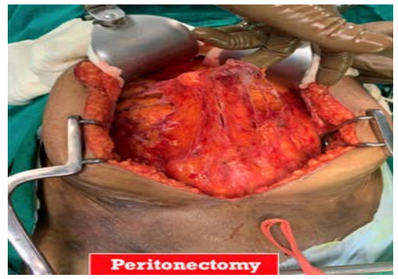


Fig.1 Anterior parietal peritonectomy and pelvic peritonectomy

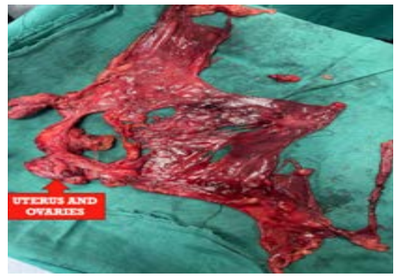
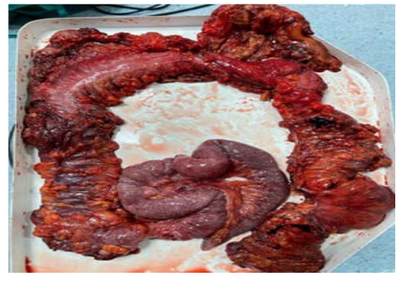


Fig.2 Total proctocolectomy



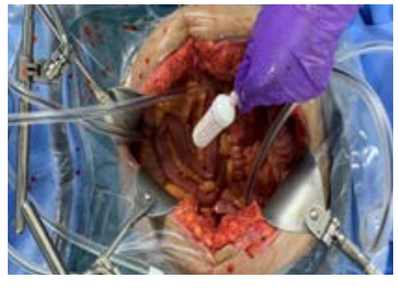
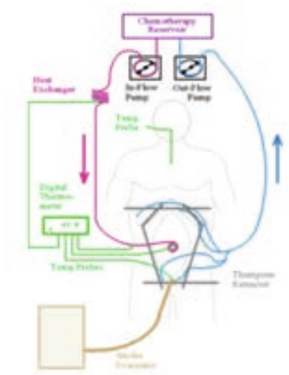
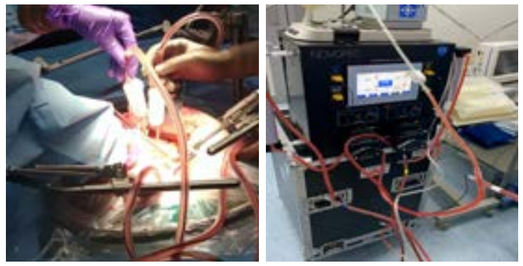


Fig.4 HIPEC





Hyperthermic Intraperitoneal Chemotheraph

Fig.5 HIPEC perfusion system

Postoperative course:

•No Renal failures ((None had creatinine levels above 1.4)

•No requirements of dialysis

•No significant haematologic toxicity (None required blood products above what transfused during routine CRS procedure)

•All patients extubated within 12-18 hrs (3 extubated on table)

•No Reexplorations within 30 days of procedure

•No Chest tube placements

•No prolonged Ryle tube aspirations (RT removed within 12-24 hrs)

•Postoperative stay ranged from 9-18 days with a median stay of 10 days

Postoperative complications:

•Salt loosing nephropathy-1

•POPF - 1 (required drain to be kept for 3 weeks) - nonsplenectomy patient

•Paralytic ileus/Delayed passage of flatus - 4 patients (>4 days)

•Readmission - 1 (intraabdominal fluid collection) managed conservatively

•Parastomal fistula (required revision of stoma, presented more than 30 days after surgery) - 1

Therefore as per Clavien Dindo classification, only one patient had above grade II complication. No mortality was observed among all 8 patients.

Usual start of Adjuvant chemotherapy was between 20-35days. All 8 patients could complete three cycles of adjuvant chemotherapy.

Follow up:

Out of 8 patients, 4 patients recurred. First patient recurred after a disease free interval of 2 years. This patient was advised secondary cytoreductive surgery in view of localized tumor nodule on sigmoid colon but refused surgery and has not yet started treatment. She is presently asymptomatic and alive with disease. Three patients recurred after 6-9 months of disease free interval. One out of these three presented with intestinal obstruction, another one presented with peritoneal disease and is started on chemotherapy while the third one has yet to start treatment. Rest 4 patients are alive without disease.

Conclusion:

Our experience albeit small confirms the feasibility and safety of HIPEC in interval setting for advanced ovarian cancer. Although there was a selection bias towards younger age and well controlled comorbidities.

It is known that dedicated surgical team and a multidisciplinary effort can improve a program's complete and optimal cytoreduction rates over time. CRS with HIPEC has an acceptable post operative morbidity which could even be improved with centralization6. We reiterate the same and emphasize that strict adherence to protocol based perioperative management along with increasing experience provide better patient selection, surgical technique and lower failure to rescue rates.

08

Why detection of Early Precancerous Lesions in the oral cavity is important?

DR. MANJIRI CHAPRE, Clinical Associate Dentristry – Department Of Rehabilitation

INTRODUCTION:

Among oral diseases, oral cancer is a critical health issue due to its life-threatening potential. Globocan, in its 2020 report, estimated ~0.37 million new cases of oral cancer, with the majority of them coming from the Asian continent1. Lesions with dysplastic features have been categorized under Oral Potentially Malignant Disorders (OPMDs), such as Oral Leukoplakia, Erythroplakia, Oral submucous fibrosis (OSMF), and Proliferative Verrucous Leukoplakia, which one are assumed to have a high risk of malignancy. The development of oral cancer from OPMDs is common, especially in South Asian countries like India where tobacco and areca nut consumption is prevalent. Differences in the oral manifestation of these lesions have always been a big hurdle in the clinical decision making.

CLINICAL FEATURES:

OPMDs are defined as "any oral mucosal abnormality that is associated with a statistically increased risk of developing oral cancer." 2 Characteristically, OPMDs present with diverse clinical attributes, such as colour variations (white, red, and mixed white-red), morphological changes (plaque/plateau, smooth, grooved, wrinkled, granular, atrophic), and different sizes, involving different anatomical sites in the oral cavity like lips, the mucosal lining of the cheek, floor of the mouth, anterior two third of tongue, upper and lower gingiva (gums) and hard palate. Interestingly, not all oral lesions develop into oral cancer, whereas some morphological alterations are highly susceptible to malignant transformation.

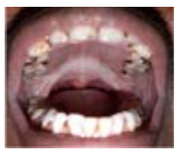
MALIGNANT POTENTIAL:

Various studies have estimated that the prevalence of OPMDs varies among the populations and is mainly associated with habits. The majority (~80%) of oral cancer cases originate from OPMDs. The overall malignant transformation (MT) rate of OPMDs is 7.9%, indicating the seriousness of the problem.3

IMPORTANCE OF EARLY DETECTION:

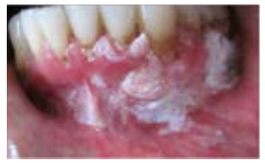
There is general consensus that the clinical stage at the time of diagnosis is the most important predictor of recurrence and mortality in oral cancer patients. The time to diagnosis is influenced by multiple clinical and sociodemographic variables, including patient reluctance to consult a health-care professional due to lack of access to health care, especially in patients with low socioeconomic status, as well as professional delay in diagnosing and treating the disease. Clinicians can improve patients' survival rates if a cancerous lesion is detected at an early stage, or if a precursor lesion (dysplasia) is discovered and treated prior to malignant progression.[4]

Leukoplakia on ventral aspect of tongue

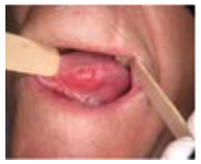


Oral submucous fibrosis

Oral lichen planus



Proliferative verrucous leukoplakia on attached gingiva and alveolar mucosa



Erythroplakia on lateral border of tongue

NON-INVASIVE TOOLS FOR EARLY DETECTION

Recent advancements in oral cancer research have led to the development of potentially useful diagnostic tools at the clinical and molecular level for the early detection of oral cancer.

1.	VITAL STAINING	55 Acetic acid Toluidine Blue Methylene Blue Lugol's Iodine Rose Bengal Iodine staining Tolonium chloride
2.	LIGHT - BASED DETECTION SYSTEMS	Tissue fluorescence imaging (Velscope, identafi 3000) Chemiluminiscence (ViziLitie, Pluse, Microlux/DL) Tissue fluorescence spectroscopy (NBI)
3.	HISTOLOGICAL TECHNIQUES	Incisional biopsy Excisional biopsy
4.	CYTOLOGICAL TECHNIQUES	Oral Brush biopsy (Oral CDX) Liquid Based Cytology Laser Microdisection (LCMD)
5.	MOLECULAR ANALYSES	Gene alterations Epigenetic alterations, loss of Heterozygosity and Microsatellite instability Viral genome studies Proliferation index and AgNOR Analysis Immunohistochemical identification of tumor markers.

(Carreras-Torras C, Gay-Escoda C. Techniques for early diagnosis of oral squamous cell carcinoma: Systematic review. Medicina Oral, Patologia Oral y Cirugia Bucal. 2015 May;20(3):e305-15.)

Various systematic reviews and meta-analysis evaluated the efficacy of various index tests like imaging-based techniques and staning compared to the gold standard of histopathology to assess their ability to correctly identify the presence of OPMDs. The validity of Narrow Band Imaging in the assessment of suspicious oral lesions demonstrated a specificity and sensitivity of 75.7% with 95% CI 65.1–83.9% and 91.5% with 95% CI 81.8–96.3%, respectively. NBI could play a decisive role in a surveillance setting for low-risk lesions or lesions for which multiple biopsies may not be practical.6 The best sensitivity performance of Toludine Blue was found to be 92.3% showing it as a noninvasive method that offers real-time clinical information that may aid in completing a biopsy, biopsy site selection, and referral.7 VELscope® showed a sensitivity and specificity for the detection of a dysplastic and cancer lesion of 100% and 12.5%, respectively, demonstrating that VELscope® is useful in the detection of oral lesions, but not able to differentiate high risk and low-risk lesions.So, it cannot replace biopsy but could help to detect the right location for the procedure.8 Molecular diagnostics is the employment of techniques used in molecular biology for the purpose of assessing disease risk, presence and therapeutic efficacy. Various techniques like Immuno-histochemistry, In situ hybridization, Mass spectrometry, Proliferation index, Flow cytometry, Microarrays, Next generation sequencing have been used for understanding the spectrum of these OPMDs.

9 Ultimately, these index tests can be used as an adjuncts for histological tests like biopsy, which remains the gold standard procedure in the diagnosis of OPMDs. The integration of clinical examination, histopathology and molecular diagnostics will advance the ability to risk stratify individuals for the development of OSCC and move towards decreasing the impact of this devastating disease.

Conclusion :

Oral cancer has a tendency to be detected at late stage which is detrimental to the patients because of its high mortality and morbidity rates. So, in order to prevent transformation of precancerous lesions in malignancies, early detection and management becomes crucial to reduce the burden of this devastating disease. It is mandatory to screen the oral cavity thoroughly in proper illumination to avoid misinterpretations of the lesions. Despite of significant advances in cancer treatment, early detection of oral cancer and its curable precursors remains the best way to ensure patient survival and improved quality of life.

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09

ENHANCED RECOVERY AFTER SURGERY- ROLE OF PHYSIOTHERAPY INTERVENTION!

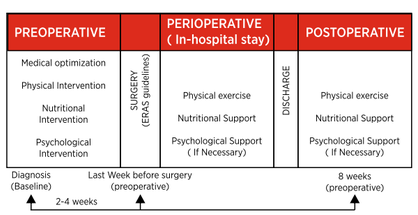
DR NEHA DESHPANDE, Junior Physiotherapist, Department of Rehabilitation
DR PRADNYA PATHAK, HOD - Department of Rehabilitation
DR MANJUSHA HINGE, Consultant - Department of Rehabilitation Therapist

Enhanced Recovery after Surgery (ERAS) protocol launched in July 2019 is a new surgery protocol that aims to shorten the length of hospital stay for patients, decrease morbidity, facilitate early mobility and recovery while improving patient outcomes and overall experiences.

Surgery disrupts the physiologic balance and triggers a general stress response. Even without peri-operative complications, surgical stress is associated with a decrease in 20–40% of functional capacity.

Pre -habilitation programs are aimed at enhancing surgical recovery by raising the patient's functional and metabolic reserves before intervention. Also, continuation and further progression in prescribed exercises post surgery. Enduring the course of adjuvant treatment can have additional benefits in maintaining better functional capacity of patients and overall treatment outcomes.

Pre-habilitation may include exercises, nutritional and dental counseling, psychological support and strategies to optimize underlying conditions and promote cessation of negative health behaviors.



Patients are assessed for adequate pre-operative Level of physical activity using cardiopulmonary exercise testing or 6 minute walk test, inspiratory and peripheral muscle strength and QOL using disease appropriate questionnaire in head and neck, lung, gastrointestinal and gynecological cancer surgeries. These parameters are hugely affected by the implementation of any neoadjuvant therapy like chemo and radiation prior to surgery. Chemotherapy results in increased level of fatigue which contributes in reduction of functional capacity and muscle strength. Also, other factors like peripheral neuropathy, radiation induced fibrosis etc can lead to decreased mobility and muscle strength.

In head and neck surgery preoperative airway maintenance techniques like breathing exercises to increase lung capacity and forced expiratory techniques like coughing and huffing are taught with shoulder and neck strengthening and general endurance exercises. Breathing exercises and ambulation are commenced 24hrs after surgery for early recovery while shoulder and neck mobility with mouth opening exercises are started after suture removal.
In thoracic-abdominal surgeries like lung, gynecological and gastrointestinal cancer Functional exercise capacity is evaluated with the 6-MWT which is a submaximal test and VO2Max is calculated. The 6-MWT is performed at baseline, before surgery, and 8 weeks after surgery. Exercises are prescribed according to the guidelines provided by American college of sports medicine that are mentioned below.

Group (VO_2max)	Aerobic exercise	Strength Exercise	Flexibility exercise	IMT exercise	Frequency
Mild (<12mL/kg/min)	High intensity interval walking of 6min (objective >5000 steps/day)	Wall push-ups 10x1, chair squats 10x1 chair abdominals 10x1	Lateral and frontal arms movement 10x1	Inspiratory threshold-loading device 10/8hours	Daily supervised physical therapy program
Moderate (>12-14mL/kg/min)	Walking of 6min rounds at highest effort (objective>7500 steps/day)	Wall push-ups 10x2 chair squats 10x2 chair abdominals 10x2	Lateral and frontal arms movement 10x2	Inspiratory threshold-loading device 10/8hours	Daily home-based exercise program
Intense (>14mL/kg/min)	Walking of 6min rounds at highest effort (objective >10 000 steps/day)	Wall push-ups 15x3 chair squats 15x3 chair abdominals 15x3 or elastic band	Lateral and frontal arms movement 15x3	Inspiratory threshold-loading device 10/8hours	Daily home-based exercise program

IMT, inspiratory muscle training: VO2max, Maximum oxygen consumption

In lung surgery,exercises to improve chest expansion and capacity like inspiratory threshold device, segmental expansion exercises etc with thoracic and shoulder mobility are taught after preoperative assessment of the patient which are also practiced as early as 24hrs post surgery so as to avoid complications like lung collapse, consolidation and pleural effusion.
In gastrointestinal surgeries inspiratory muscle training using various breathing exercises and devices as well as lower limb resistance training is taught preoperatively. Core muscle activationand trunk mobility exercises arefurther included in treatment regimen so as to improve abdominal muscle strength which is lost due to extensive surgical resections and can lead to issues like chronic low back and abdominal pain.

In gynecological surgeries in addition to above mentioned exercises pelvic floor muscles training and strengthening exercises are prescribed as surgeries and adjuvant therapy can lead to pelvic floor dysfunctions like urinary and bowel incontinence.

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10

ROLE OF NURSES IN NUTRITION MANAGEMENT

ANKITA MURKUTE
STAFF NURSE - Department of Nursing

“Every nurse was drawn to nursing because of a desire to care, to serve, or to help”

Nurses are the backbone of health care system they spend the maximum time with the patient they know everything about the patient if the patient is admitted for the long time in hospital they are the friends or become as companion of the patient they are not just administrating the drugs or checking the vitals but they are also encouraging the patient to eat or if the patient is not capable of feeding themselves they are feeding them properly so that they recover fast. Nurses knows how much the patient eating if not eating or they develop any intolerance like diarrhoea,vomiting due to feed it is been first raised by the nurses to the doctors or the dietician, to change the diet plan according to their health condition

- Nurses have the expertise and responsibility to ensure that patient nutritional needs are met according to the nutritional plan made by the dietician
- Providing nutritional screening and inform the dietician so that they together work to improve healthy eating and subsequent health outcome.
- Can act as a facilitator for dietary change among patients.
- A nurse can guide people to choose optimum and balance diet, remove prejudices and promote good dietary habits.
- Providing mealtime assistance and nutrition support therapy.
- Monitoring, managing, or evaluating the impact of nutrient and dietary therapies.
- In hospital, nurses has to take care of nutritional aspects of the admitted patient in ward.
- Educates the patient as well as family member regarding the importance of the healthy and nutritious diet.
- Maintaining parental nutritional for the patient.
- Giving tube feeds or maintaining the hygiene of the tube and educating regarding the same for patient and relatives
- Maintenance of adequate hydration.
- Helps in monitoring the conditions of the patient like vomiting, input output electrolyte monitoring in the diet.
- Educates the patient as well as family member regarding the importance of the healthy and nutritious diet.
- Identify and implement change in method of feeding and time of feeding.
- Identify and communicate needed change in the patient's diet to the dietician
- Serving meal trays to patients in a prompt and positive manner.
- Helping the patient understand the important of diet and encouraging dietary compliance.
- Observing clinical signs of poor nutrition and reporting them.
- Taking and recording patients weight.

There should be a nutrition nurse in each ward to monitor the compliance of the diet encourage patient and do the basic nutritional screening and informing dietician, check the hygiene of the tube and the feeds.

We as nutrition nurses can help to get the overall improvement and better outcome in patient

Nurses making and administrating feed

Nurses making and administrating feed

11

Bone marrow examination: An audit from tertiary care oncology centre

DR. ASHISH OMPRAKASH BOHRA, Consultant - Department of Hemato Pathology/ Molecules Pathology
DR. MEENA PANGARKAR, HOD - Department of Laboratory Medicine

Introduction:

Bone marrow aspiration and biopsies are the main pillars in the diagnosis of haematological disorders. The ability of these methods to avoid more invasive procedures, as well ease to perform these procedures on outpatient basis under local anaesthesia makes them a very important diagnostic tool in medical oncology. These procedures can yield accurate diagnosis in relatively short amount of time and in skilled hands its relatively uncomplicated to perform.

Bone marrow examination is not only an integral tool to establish diagnosis of haematological disorders but also a very important tool to assess response assessment, effect of chemotherapy & unexplained cytopenias. Bone marrow procedures are performed both in outpatient and inpatient basis. Most common site used is posterior superior iliac spine, though other sites can be used such as sternum or anterior superior iliac spine in relevant scenarios.

Indications for definitive diagnosis of leukaemia's, plasma cell dyscrasias, chronic myeloproliferative or lymphoproliferative neoplasms & MDS. It is also a very important tool in response assessment in leukaemia's and plasma cell dyscrasias. In a tertiary care oncology hospital, it can also help to solve the riddles of unexplained cytopenia's in solid organ neoplasms.

There are very few absolute contraindications for procedure such as bleeding diatheses, skeletal abnormalities and local site infection. Thrombocytopenia is not an absolute contraindication for the procedure.

Post-operative bleeding is rare but the most common complication. Rarely, internal haemorrhage can occur due to injury to internal iliac or superior gluteal artery, when the site is posterior superior iliac spine. Sternal aspiration are more prone to serious and life-threatening complications. Sternal punctures must not be performed in children below 12 years of age. Haemorrhage, cardiac tamponed or death can occur if needle is misplaced during sternal puncture. Lastly infection of the procedural site if proper sterile technique is not followed

Objective:

To evaluate the utility, indications and outcomes of bone marrow aspiration & biopsy procedures from 1.1.2022 till 12.9.2022.

Methods:

A simple Observational study design using the data from 1st January 2022 to 12th September 2022. The data was maintained by the department of laboratory medicine, in haematology section.

Results:

A total of 111 bone marrow examinations were performed during the current year till 12.09.2022. The male to female ratio is 2.08:1. Age range is from 17 to 79 years with mean of 49.67, median of 53years. Out of 111 bone marrow examinations, 71 procedures were performed for the diagnostic purpose. Whereas 40 procedures are for follow up after initial diagnosis, majority for response assessment. Of the 71 diagnostic bone marrow procedures 53 cases had a neoplastic condition, whereas 18 cases were diagnosed with benign conditions.

Demographic Characteristics

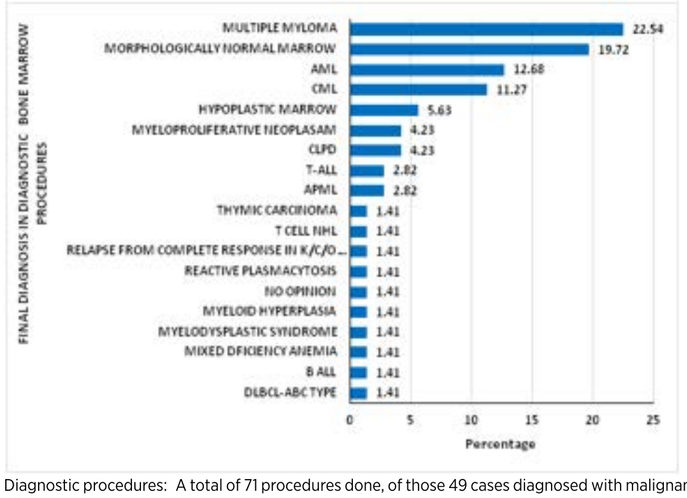
Table 1: Age distribution

Sr. No.	Age Group	Diagnostic	%	Follow-up	%	Grand Total	%
1	0-20	5	7.04	5	12.5	10	9.01
2	20-40	14	19.72	10	25	24	21.62
3	40-60	31	43.66	15	37.5	46	41.44
4	60-80	21	29.58	10	25	31	27.93
	Grand Total	71	100.00	40	100	111	100.00

Table 2: Gender distribution

Sr. No.	Gender	Diagnostic	%	Follow-up	%	Grand Total	%
1	**Male**	47	66.20	28	70.00	75	67.57
2	**Female**	24	33.80	12	30.00	36	32.43
	Grand Total	71	100.00	40	100.00	111	100.00

Graph 1: Diagnostic Details :



Diagnostic procedures: A total of 71 procedures done, of those 49 cases diagnosed with malignant neoplasm. Whereas 22 cases were of non-malignant pathology. Majority of these cases in which some types of malignant pathological conditions were suspected, 14 were labelled as morphologically normal marrow. Four cases were diagnosed as Aplastic anaemia on bone marrow biopsy. One case was diagnosed as Mixed deficiency anaemia which presented with bicytopenia and was known case of carcinoma breast. Now, from the diagnosed malignant (49) – pathological cases, most common diagnosis was of multiple myeloma (16), followed by Acute leukaemia (13), CML (8), Involvement of bone marrow by metastatic neoplasms (3), myeloproliferative neoplasms (3), chronic lymphoproliferative neoplasms (3), and 1 case of Myelodysplastic syndrome. Acute leukaemia cases are less, probably because in many cases with high presenting Total leucocyte count, bone marrow procedure is not required, as ancillary test like flowcytometry, cytogenetics and molecular testing can be performed from peripheral blood.

Follow up procedures: A total of 40 procedures done, of which 20 procedures were done for the response assessment of acute leukaemia's (viz AML, B & T ALL and APML), followed by response assessment of multiple myeloma (15).

There were three diagnosed cases of Chronic myeloid leukaemia, routinely we don't do follow up marrow examination's in CML but these cases presented with pancytopenia, while on treatment with tyrosine kinase inhibitors. Two of them diagnosed with Aplastic anaemia on bone marrow biopsy and one case showed marked fibrosis with marked megakaryocytic hyperplasia. There was one case of primary myelofibrosis on Tab. Thalidomide, presented with pancytopenia, marrow was fibrotic with bone marrow lymphocytosis. One case of low-grade lymphoproliferative disorder, patient received 4 cycles of rituximab, presented with unexplained cytopenia's. This patient was diagnosed as Aplastic anaemia on bone marrow biopsy.

Table 3:

Sr. No.	RESPONSE ASSESMENT IN FOLLOW UP MARROW EXAMINATION	NO. OF CASES	%
1	MORPHOLOGICAL REMISSION (AL)	17	42.50
2	VERY GOOD PARTIAL RESPONSE (MM)	9	22.50
3	HYPOPLASTICC MARROW	4	10.00
4	PARTIAL RESPONSE (MM)	3	7.50
5	RELAPSE	2	5.00
6	BONE MARROW LYPMHOCYTOSIS	1	2.50
7	BONE MARROW NECROSIS	1	2.50
8	COMPLETE REPSONE(MM)	1	2.50
9	COMPLETE RESPONSE WITH INCOMPLETE COUT RECOVERY (AL)	1	2.50
10	PROGRSSION TO MYELOFIBROSIS	1	2.50
	Grand Total	40	**100.00**

Graph 2: RESPONSE ASSESMENT IN FOLLOW-UP MARROW EXAMINATION

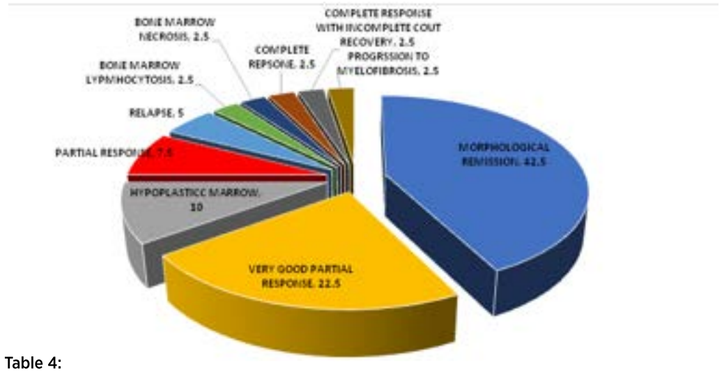


Table 4:

Sr. No.	RESPONSE IN MULTIPLE MYLOMA	NO. OF CASES	%
1	VERY GOOD PARTIAL RESPONSE	9	60.00
2	PARTIAL RESPONSE	3	20.00
3	COMPLETE REPSONE	1	6.67
4	HYPOPLASTIC MARROW	1	6.67
5	RELAPSE	1	6.67
	Grand Total	**15**	**100.00**

Table 5:

Sr. No.	RESPONSE ASSESSMENT IN ACUTE LEUKEMIA	AML	%	APML	%	B ALL	%	T ALL	%	Grand Total	%
1	BONE MARROW NECROSIS		0		0.00	1	12.50		0.00	1	5.00
2	COMPLETE RESPONSE WITH INCOMPLETE COUT RECOVERY		0		0.00		0.00	1	25.00	1	5.00
3	MORPHOLOGICAL REMISSION	6	85.71	1	100.00	7	87.50	3	75.00	17	85.00
4	RELAPSE	1	14.29		0.00		0.00		0.00	1	5.00
5	**Grand Total**	7	100	1	100.00	8	100.00	4	100.00	20	100.00

Ancillary testing: Bone marrow procedure serve as a primary tool for providing biological samples for ancillary testing including flowcytometry, cytogenetic and molecular studies. In the current era most these techniques are needed for exact diagnosis, prognosis and deciding the targeted treatment options. It also helps in assessment of early relapse detections. In our audit amongst the diagnostic procedures most commonly performed investigation is flowcytometry followed by IHC. In follow up samples, again the most common investigation done is flowcytometry followed by IHC. The detailed account of various ancillary test performed, is represented in the following table and bar diagrams.

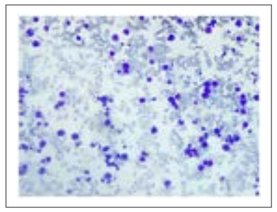


Figure 1 (Leishman) BMA10x scattered plasma cells

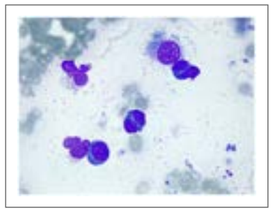


Figure 2: (Leishman) BMA 40x Binucleate Plasma cells

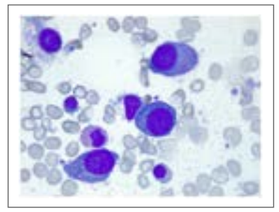


Figure 3: (Leishman) BMA 100x Plasma cells (MM)

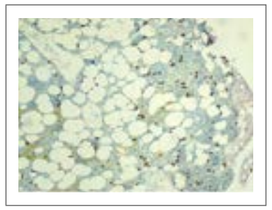


Figure 4: BMB 10x IHC CD 138

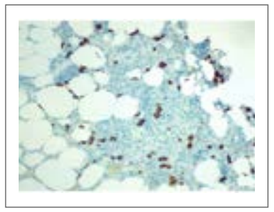


Figure 5: BMB 40x IHC kappa light chain

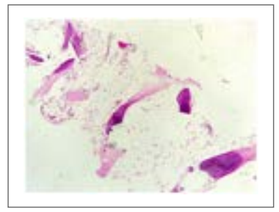


Figure 5: BMB 40x IHC kappa light chain

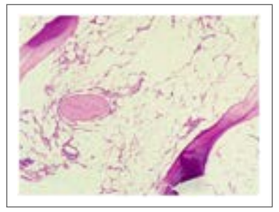


Figure 1 (Leishman) BMA10x scattered plasma cells

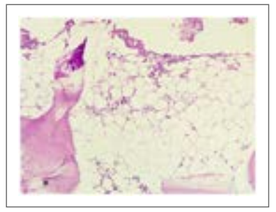


Figure 2: (Leishman) BMA 40x Binucleate Plasma cells

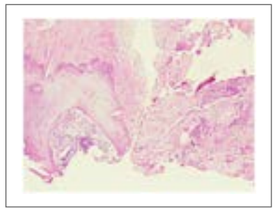


Figure 3: (Leishman) BMA 100x Plasma cells (MM)

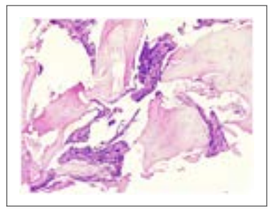


Figure 4: BMB 10x IHC CD 138

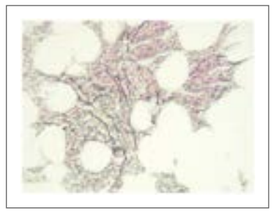


Figure 5: BMB 40x IHC kappa light chain

Table 6:

Sr.No.	BMB	Diagnostic	%	Follow-up	%	Grand Total	%
1	Yes	63	88.73	24	60.00	87	78.38
2	No	8	11.27	16	40.00	24	21.62
	Grand Total	71	100.00	40	100.00	111	100.00

Table 7:

Sr. No.	IHC	Diagnostic	%	Follow-up	%	Grand Total	%
1	Yes	9	12.68	11	27.50	20	18.02
2	No	62	87.32	29	72.50	91	81.98
	Grand Total	71	100.00	40	100.00	111	100.00

Table 8:

Sr. No.	FLOWCYTOMETRY	Diagnostic	%	Follow-up	%	Grand Total	%
1	Yes	16	22.54	14	35.00	30	27.03
2	No	55	77.46	26	65.00	81	72.97
	Grand Total	71	100.00	40	100.00	111	100.00

Table 9:

Sr. No.	FISH	Diagnostic	%	Follow-up	%	Grand Total	%
1	Yes	19	26.76		0.00	19	17.12
2	No	52	73.24	40	100.00	92	82.88
	Grand Total	71	100.00	40	100.00	111	100.00

Table 10:

Sr. No.	CK	Diagnostic	%	Follow-up	%	Grand Total	%
1	Yes	15	21.13		0.00	15	13.51
2	No	56	78.87	40	100.00	96	86.49
	Grand Total	71	100.00	40	100.00	111	100.00

Table 11:

Sr. No.	Molecular	Diagnostic	%	Follow-up	%	Grand Total	%
1	Yes	7	9.86		0.00	7	6.31
2	No	64	90.14	40	100.00	104	93.69
	Grand Total	71	100.00	40	100.00	111	100.00

Table 12:

Sr. No.	Molecular	Diagnostic	%	Follow-up	%	Grand Total	%
1	Yes	7	9.86		0.00	7	6.31
2	No	64	90.14	40	100.00	104	93.69
	Grand Total	71	100.00	40	100.00	111	100.00

Our Experience:

Bone marrow aspirate and biopsy are the common procedures in hematopathology. As a consultant in haematology, after explaining the procedure, written consents, is taken and the procedure is performed. Patients feedback is documented.

Pain was the most common complication of bone marrow procedure. In our experience, psychological anxiety depends on the priming of the patient about procedure, & how you converse with the patient during procedures. Is our setting, pain was "mostly well tolerated ". we didn't encounter any other procedure related side effect like, bleeding or local site infection.

We used all steel Salah's needle for bone marrow aspiration procedure and Jamshedi needle for bone marrow biopsies. We used local anaesthesia, Lignocaine 2% for both the procedure. All the procedures performed, yielded adequate samples including bone marrow aspirates, biopsies and imprint smears on case-to-case basis.

Conclusion:

Bone marrow examination play a significant role in diagnosis and response assessment of haematological neoplasms. A through pre procedural assessment, clinical corelation and adequacy of bone marrow sample further improves the importance of bone marrow procedure in a tertiary care oncology centre.

12

NEVER LOOSE HOPE IN LUNG CANCER..!! CASE REPORT

DR SAMEER SHRIRANGWAR, Consultant – Department of Medical Oncologist

We publish first case report from India with CD74-ROS1 fusion non-small cell lung cancer who was treated with Entrectinib.

INTRODUCTION:

Recurrent gene fusions are oncogenic drivers of various cancers. ROS1 fusion transcriptions are rare and detected in only 0.7-1.9% of NSCLC patients globally. ROS1 fusions include the kinase domain-containing 3 region of ROS1 fused to various 5 or upstream partners, the most common of which is CD74.

Targeted therapy for patients with ROS1 fusion-positive NSCLC requires effective coverage of the CNS, a common site of metastases. Up to 36% of patients with ROS1 fusion-positive NSCLCs have brain metastases at the diagnosis of advanced disease, and many others will subsequently develop intracranial metastases. The tyrosine kinase inhibitor (TKI) crizotinib is approved by several regulatory agencies for the treatment of patients with advanced ROS1 fusion-positive NSCLC. Unfortunately, crizotinib has suboptimal CNS penetration

Entrectinib is an important therapeutic option for patients with ROS1 inhibitor-naive, ROS1 fusion-positive NSCLC. The intracranial activity of entrectinib is of particular importance because of the frequency of CNS involvement in ROS1 fusion-positive NSCLC and the suboptimal ability of crizotinib to penetrate the CNS.

CASE DETAILS :

In March 2020, A 52 year old lady presented to our OPD at NCI, Nagpur with complains of headache and vomiting since 1 month. She did not have any co-morbidities. She had no history of smoking or tobacco consumption. She had underwent MRI brain outside which was reported to have multiple rounded enhancing lesions suggestive of metastasis.

A computed tomography (CT) scan of thorax plus abdomen plus pelvis revealed irregular soft tissue mass in left lobe of lung with multiple nodules in both lungs, enhancing lesions in segment V of liver, few enlarged prevascular lymph nodes. The clinical staging was (TNM) stage IVb.

Histological examination on CT guided biopsy from liver lesion revealed adenocarcinoma of lung. Molecular testing panel (EGFR by RT-PCR, ALK and ROS1 by IHC) was ordered which revealed wild type EGFR. ALK and ROS1 fusion testing could not be performed as tissue was not adequate. PDL1 testing was not performed as the patient was not affording for immune checkpoint inhibitors (ICI).

In April 2020, patient underwent whole brain radiotherapy for brain metastases with a total dose of 20 Gy in 5 fractions. In May 2020, Patient was initiated on Palliative chemotherapy of Carboplatin plus Pemetrexed once every 21 days. A CT scan was performed in July 2020 after 4th cycle of chemotherapy showed partial response. The patient continued on Carboplatin plus Pemetrexed till 6 cycles followed by which started on maintenance single agent Pemetrexed. Follow up CT scan was performed in November 2020, after 3rd dose of maintenance chemotherapy which showed stable disease. She was advised to continue on maintenance chemotherapy. CT Scan was again performed after 7th cycle of maintenance chemotherapy in March 2021 which showed progressive disease.

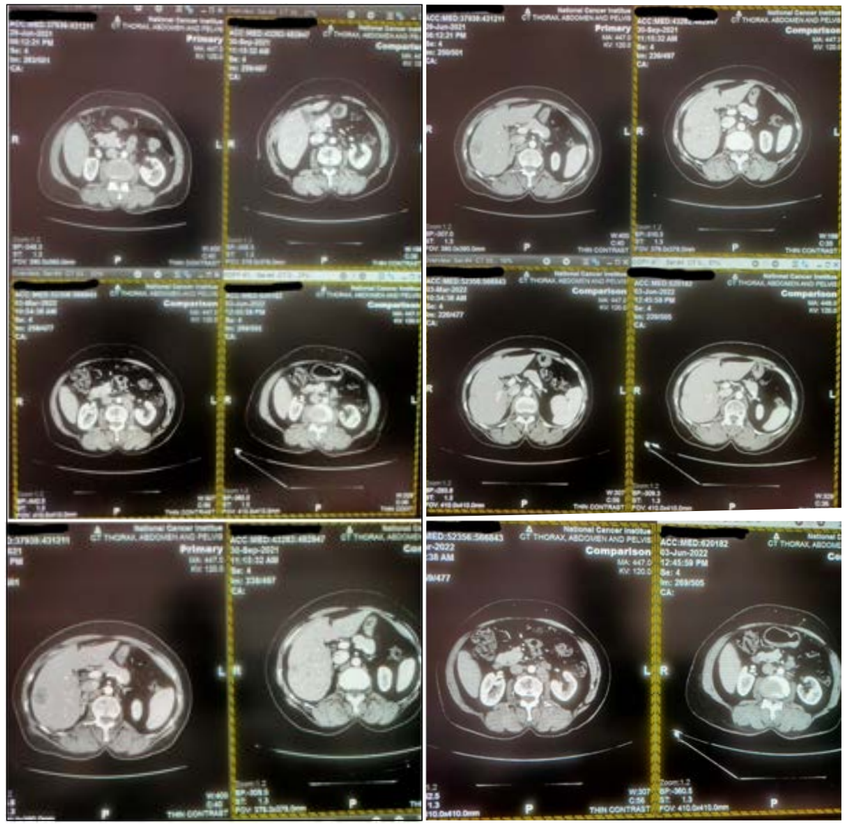
Following this we did repeat biopsy from new lesion and sent for NGS testing. The patient was started on palliative 2nd line chemotherapy with Docetaxel while awaiting NGS report and showed partial response after 3 cycles in May 2021. However, the response was not durable and the patient progressed after 5 cycles of Docetaxel in June 2021.

Meanwhile the NGS report dated march 2021 showed **CD74-ROS1 fusion**. Subsequent to this, we had already applied for procurement of Entrectinib under Roche Products India Pvt. Ltd. Compassionate Use Program .

Upon her progression on docetaxel in June 2021, the patient was started on tablet **Entrectinib 600mg OD** in June 2021 provided by Roche Products India Pvt. Ltd. First Follow up CT scan done after 3 months of Entrectinib in Septemeber 2021 showed partial response and she was continued on Tab. Entrectinib. However next follow up CT scan done in March 2022 revealed progressive disease, with significant increase in the size of retroperitoneal lymph nodes with no significant changes at other sites of disease.

As she had oligoprogressive disease, In April 2022, Patient was given local RT (radiotherapy) (30 Gy in 20 fractions) to the oligoprogressive retroperitoneal lymph node sites and continued on tablet Entrectinib. Post RT, CT scan in June 2022 showed significant regression in the size of retroperitoneal lymph nodes and remaining lesions showed stable disease.

Thus far in October 2022 the patient remains stable and asymptomatic on treatment with entrectinib after 16 months without significant toxicities.



13

EXTRAPULMONARY INFLAMMATORY MYOFIBROBLASTIC TUMOUR:

A case report from central India

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Dr ASHISH VAIDYA, 1. Consultant – Department of Medical Oncology
DR SHASHIKANT JUVEKAR, 2. HOD- Department of Radiology
DR AMOL GULKARI, 2. Consultant - Department of Radiologist
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INTRODUCTION:

Inflammatory Myofibroblastic Tumour (IMT) is a rare type of tumour comprised of differentiated myofibroblastic spindle cells, infiltrated by many inflammatory cells and is usually accompanied by conspicuous lymphoplasmacytic infiltrates and a myxoid stromal background. [1].The status of IMT as either a reactive lesion or true neoplasm has not been defined. The Fourth Edition of the World Health Organization (WHO) Classification of Tumours of Soft Tissue and Bone (2013) [2] classified IMT as an intermediate neoplastic lesion (aggressive, with occasional metastases). It can occur anywhere in the body but is most frequently documented in the lung, retroperitoneum, and gastrointestinal tract [3], and it is rarely located in the soft tissue of the extremities, bones, or joints. A proportion of IMT cases exhibit local recurrences and occasional distant metastases which cannot be well explained by an inflammatory reaction [4].

The imaging manifestations of IMT are variable and display no characteristic representation on CT or MRI imaging, despite recent improvements in imaging technology [5]. IMT have a similar appearance to other typical spinal epidural lesions, such as meningioma, lymphoma, and metastatic tumour [6]. In clinical practice, nonspecific manifestations present a great challenge to diagnosis and treatment of the condition.

In this article, we report a rare and eye opener case of extra pulmonary IMT which has diagnostic challenges which has confusing clinico-radiological features of Tubercular peritonitis and Gastro-Intestinal Stromal Tumour (GIST).

KEY WORDS:

Inflammatory Myofibroblastic Tumour (IMT), Tubercular peritonitis, Gastro-Intestinal Stromal Tumour (GIST), Anaplastic lymphoma kinase (ALK1

CASE DETAILS :

IA 20 year old Indian male presented with complaints of distension of abdomen since 15 days, early satiety and weight loss. No co-morbidities or any substance abuse revealed. On clinical examination abdomen was distended, doughy on palpation with multiple nodules palpable, shifting dullness was present. His CBC showed Hb 17.1gm%, WBC 15100/cu mm, platelets 346x103/cu mm. He was sero- negative for HIV , HbsAg and HCV, his liver function, renal function and serum electrolytes were with in normal limits.

USG abdomen revealed moderate ascites with extensive peritoneal and omental deposits in mid and lower abdomen with bilateral mild hydroureteronephrosis. Ascitic fluid tapping was done , around 2.5 liters of amber coloured fluids drained out, cytology reveals chronic inflammation with hemorrhagic background, WBC 965cells/cu mm, RBC 4099cells/cu mm, 80% lymphocytes,20% mesothelial cells, proteins 3.74 gm/dl, sugar 122mg/dl, ADA 17.2 U/L; Gram stain, ZN stain and 10% KOH preparation does not reveal any microorganism, acid fast bacilli or fungus respectively.

CECT abdomen and pelvis (Figure: 1 a,b) reveals extensive multiple variable sized omental deposits in pelvis, bilateral iliac fossa, left lumber region, largest being 9.8cm x8.0 cm, multiple peritoneal nodules in entire abdomen and moderate ascites and mild irregular thickening along the greater and lesser curvature of stomach. So possibilities of GIST , tubercular peritonitis and peritoneal carcinomatosis were kept

Open Biopsy from omental nodule (Figure: 2 a,b) reveals fibro adipose tissue with mucinous, myxoid stroma and diffuse infiltrating atypical cells with pleomorphic nuclei and inflammatory cells suggestive of Pseudomyxoma peritoneii/ deposits of mucinous adenocarcinoma.

Further histopathology examination revealed poorly differentiated tumour composed of singly scattered and loose cluster of oval cells with abundant to vacuolated cytoplasm and round nuclei streaming in mucin/myxoid stroma with intervening thin walled branching blood vessels.

Immunohistochemistry (IHC) [Figure :2c] showed Vimentin focal positive, ki 67 positive 2-3%, cytokeratin 7 positive, Anaplastic lymphoma kinase (ALK1) positive, which confirms the diagnosis of Inflammatory myofibroblastic tumour.

He was Initially only once chemo, then after alk + report , started on Crizalk, on supportive care and chemotherapy with Vinblastine and Methotrexate, subsequently after receiving IHC report, chemotherapy was stopped and he was started on oral anaplastic lymphoma kinase inhibitor, Crizotinib 250mg twice a day. He was closely followed up clinically along with CBC, LFT, KFT and ECG for QT prolongation. His follow up CECT showed significant reduction in the lesions (Figure: 3a, b) after six weeks of starting oral Crizotinib. His subsequent follow up CT done at three and then six month interval reveals significant reduction of the lesion with no metastasis. His PET SCAN after a year of treatment shows complete metabolic remission and the CMR is maintained currently at end of four years. He responded well to Crizotinib and under regular follow up since last four years performing his regular duties normally without any adverse events with very excellent clinical outcome.

DISCUSSION:

IMT is a rare mesenchymal tumor with an unclear etiology. It can arise in various locations, and is locally aggressive. The first choice of treatment for IMT is surgical resection. Local recurrence may occur once or more than once, but distant metastasis is rare [7]. Approximately 50% of IMTs harbor ALK gene rearrangement with various fusion partner genes [8]. It is known that the pathological features of IMTs, such as the mitotic rate, presence or absence of necrosis, or cellular atypia, do not correspond with the clinical outcome [9,10].

In previous case reports, crizotinib has been considered to be effective for ALK-positive IMT. The patients were young and their tumour locations varied. In most cases crizotinib first resulted in a partial or better response; however, the final outcomes differed. In our case report of a Indian patient, initially there was a diagnostic dilemma about Pseudomyxoma peritoneii as Tubercular peritonitis and GIST due to high prevalence of tuberculosis in India and close radiological resemblance with GIST ; however histopathology and IHC help in accurate diagnosis. Our case also suggests that crizotinib is effective for ALK-positive IMT, regardless of where the tumour is located.

Grade 3 adverse events included ALT elevation in 11% of cases, AST elevation in 4% of cases, neutropenia in 9% of cases, QT prolongation in 2% of cases, and interstitial lung disease in 0.6% of cases in a clinical trial of crizotinib against non-small-cell lung cancer [11]. A few cases of interstitial lung disease and liver dysfunction resulted in death in phase 3 trials; however, most side effects are tolerable. This suggests that Crizotinib is a safely manageable drug, and our case also supports safety

PROFILE OF CRIZOTINIB:

In conclusion, IMTs occur in various locations; however, regardless of the tumour location, the use of ALK inhibitors, such as Crizotinib, is effective and safe for tumours harbouring ALK mutation, with good clinical outcome. In conclusion, IMTs occur in various locations; however, regardless of the tumour location, the use of ALK inhibitors, such as Crizotinib, is effective and safe for tumours harbouring ALK mutation, with good clinical outcome.

ACKNOWLEDGEMENT:

I am grateful to my teacher, guide, mentor Dr. A. B. Pathak sir, Medical Director ,who is a source of inspiration for all of us, Dr Juvekar sir HOD Radiodiagnosis, Dr Sushil Panbude , Dr Amol Gulkari, Dr Chaitali, Dr Maithili ,Dr. Mrunal, Dr Ankita, Dr Amol , Sharayu , Sanjay and NCI team , all my supportive colleagues and patient himself.

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Figure 1a,b: Pre chemo axial CT scan in soft tissue window shows omental thickening and caking and omental nodules and ascites

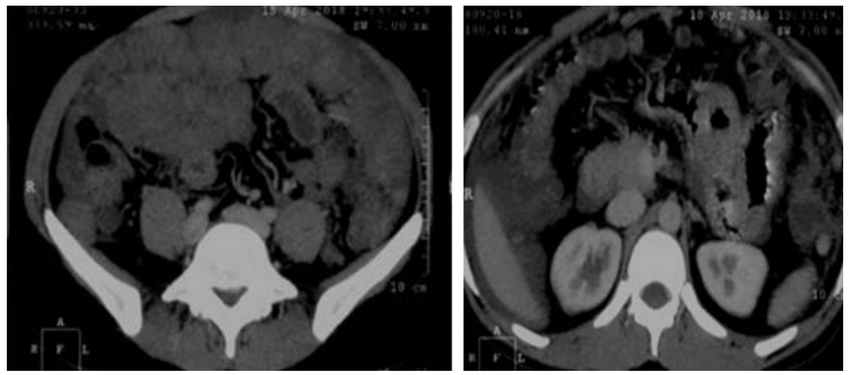


Figure : 2a (Open Biopsy of Omental nodules)

Gross appearance:

IThe tumor measured approximately 5 x 4 x 3 cm. Cut section shows solid homogenous white tumor without areas of hemorrhage and necrosis

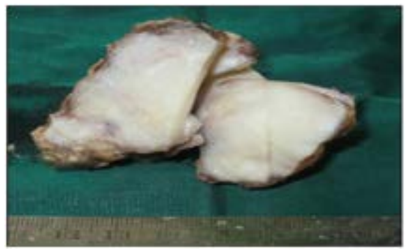


Figure: 2b

Microscopy:

Section shows neoplastic cells in arrays and sheets infiltrated by inflammatory cells.

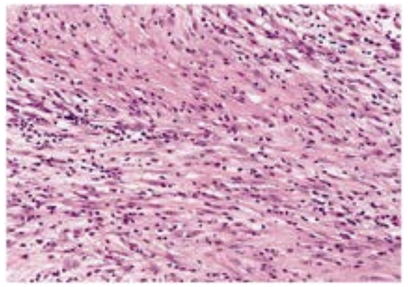


Figure: 2C

IHC:

Section shows neoplastic cells showing diffuse and strong immunoreactivity for ALK-1.

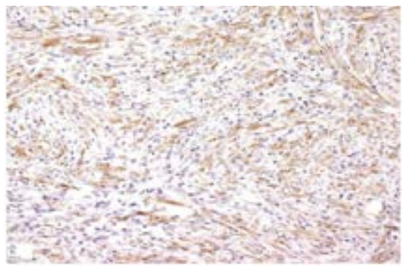


Figure 3 a,b

Follow up axial CT scan in soft tissue window reveals significant decrease in omental caking and nodule .

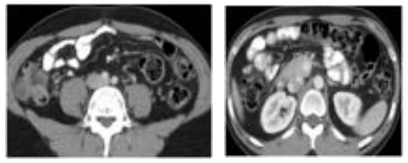


Figure 4 a

PET CT SCAN after 1 year of treatment s/o CMR

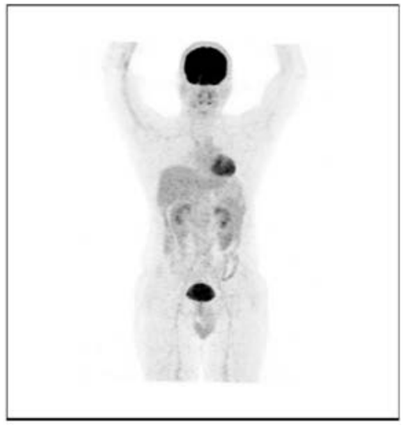
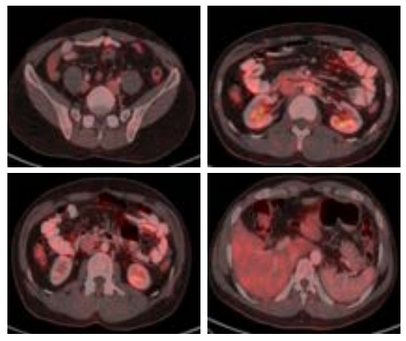


Figure 4 a

PET CT SCAN after 1 year of treatment s/o CMR



14

Early Metabolic changes in PET metrics over initial 8 weeks of treatment in patients with advanced Head Neck Squamous Cell Carcinoma treated with Chemotherapy

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Background

Head and neck cancer is the most common cancer in India and the 6th most common malignant tumour worldwide. Around 60% of patients are diagnosed in advanced stage. No biomarker is available to assess the chemotherapy response. How early to assess it is not established. So it is of paramount to integrate molecular imaging into precision oncology care, exploring the potential of imaging as a biomarker.

Methods

We conducted a prospective observational study at NCI, Nagpur, India; during 2019.The 102 advanced cases of SCC Head neck region were enrolled in study after ISC approval and informed consent. All patient's history, addictions, clinical examination were noted. Chemotherapy :Docetaxel-Cisplatin-5FU(DCF) 3 weekly 2 cycles or Paclitaxel- Carboplatin(PC) weekly 6 cycles. Imaging : Baseline PET-CT scans were done followed by response evaluation scan at 2 weeks interval. The pattern of PET metrics Tumour-SUV max and Nodal-SUV max analysed using PERCIST criteria. P<0.05 was considered statistically significant.

Table1: Demograhy N(%) and cancer sites

Age (Yrs) Median, (Range)	48.96, (25-75)
Gender	**N(%)**
Male	70(89.74%)
Female	08(10.26%)
Addiction	**N(%)**
Smoking	21(26.92%)
Tobacco	64(82.05%)
Alcohol	17(21.79%)
ECOG	**N(%)**
PS 0	56(71.79%)
PS 1	22(28.21%)
Cancer Sites	**N(%)**
a Oral Cavity	
1. Buccal Mucosa	31(39.7%)
2. Tongue (Ant)	20(25.6%)
3. RMT	02(2.56%)
4. GBS	04(5.13%)
5. Palate(hard)	03(3.85%)
6. Alveolus	08(10.3%)
b. Oropharynx	03(3.85%)
c. Hypopharynx	03(3.85%)
d. Larynx	04(5.13%)
Total (N)	78(100%)

Table2: TNM stage, Chemo

N(%)	
T1	01(1.28%)
T2	06(7.69%)
T3	15(19.23%)
T4	56(71.79%)
Lymph-Node Stage (N)	**N(%)**
Nx	01(1.28%)
N0	03(3.85%)
N1	24(30.77%)
N2	36(46.15%)
N3	14(17.95%)
Mets(M)	**N(%)**
M0	69(88.46%)
M1	09(11.54%)
Stage a Oral Cavity	**N(%)**
III	06(7.69%)
IV	01(1.28%)
IV A	49(62.82%)
IV B	13(16.67%)
IV C	09(11.54%)
Chemotherapy	**N(%)**
DCF (Docetaxel+ Cisplatin+5FU)	30(38.46%)
TC (Paclitaxel Carboplatin)	48(61.54%)

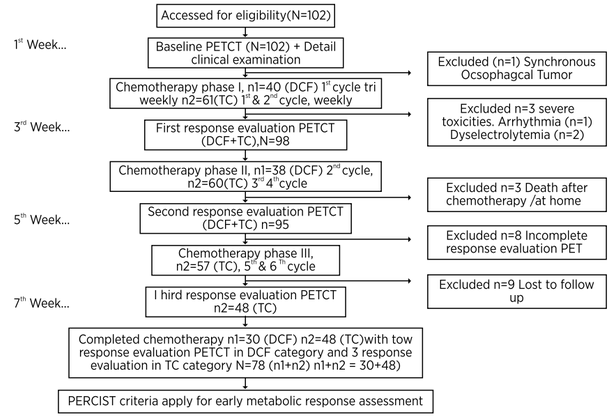
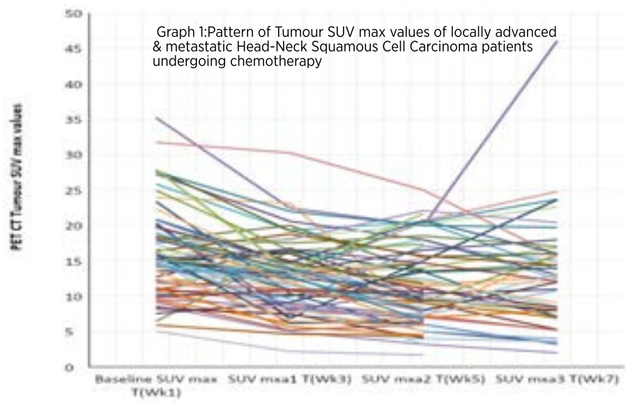


Diagram 1: CONSORT diagram of the research study

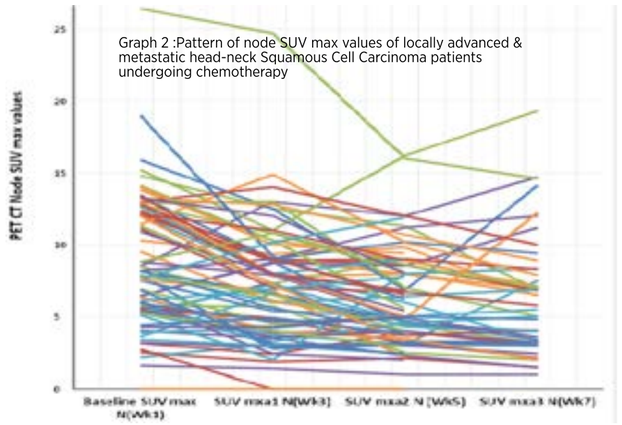
Results

The median age of study population was 48.96 yrs with male preponderance 70 (89.74%) males. The most common site involved were Buccal Mucosa in 31 (39.74%) followed by tongue 20(25.64%). The 64 (82.05%) were tobacco chewer ,17 (21.79%)alcoholic and 21(26.92%) were smokers, all were in advanced stage; 6 (7.69%) stage III ,72 (92%) in stage IV. The average(SD) PET-CT SUV max value of the primary tumour and regional node during baseline, first, second and third response evaluation were Tumour SUVmax 16.17(6.03), 12.53(4.94),11.38(5.47),12.64(7.57)and Node SUV max 8.83(4.51),7.15(3.96),6.07(3.32) and 6.31(4.04) respectively . As compared to baseline the change/decrease in PET-CT SUV max values during subsequent response evaluation at 2weeks interval during chemotherapy for primary tumour and regional lymph node were statistically significant with p<0.00001.



Time interval of chemotherapy and intermittent PETCT assessment

Bar diagram 1:PETCT SUVmax, average value of primary tumour and largest regional lymph node of Head-Neck region of study population during baseline and first, second and third response evaluation



Time interval of chemotherapy and intermittent PETCT assessment

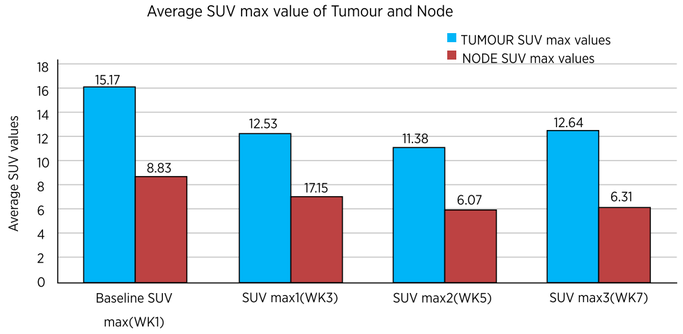
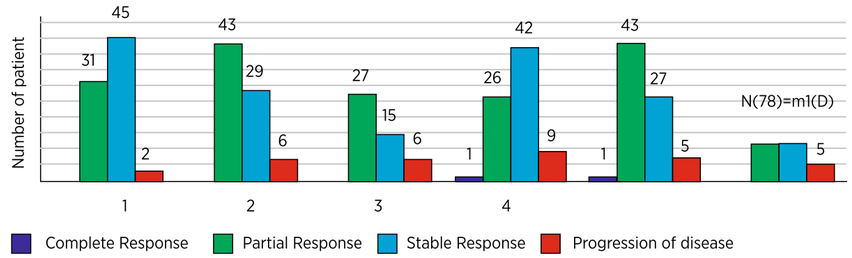


Table 3: Comparative analysis of PET SUV max avg (SD) values with p value of Primary tumour and largest regional node during baseline , 1 st, 2nd and 3 rd response evaluation :

Sr.No.	Comparison of	Sample size	Average	SD	p value
1	Baseline SUV max Tumour	78	16.17	6.03	p<0.00001
	SUV max1 Tumour(TC+DCF)	78	12.53	4.94	
2	Baseline SUV max Tumour(TC+DCF)	78	16.17	6.03	p<0.00001
	SUV max2 Tumour(TC+DCF)	78	11.38	5.47	
3	Baseline SUV max Tumour(TC)	48	16.89	5.55	p<0.00001
	SUV max3 Tumour(TC)	48	12.64	7.57	
4	Baseline SUV max Node(TC+DCF)	78	8.83	4.51	p<0.00001
	SUV max1 Node(TC+DCF)	78	7.15	3.96	
5	Baseline SUV max Node(TC+DCF)	78	8.83	4.51	p<0.00001
	SUV max2 Node(DCF+TC)	78	6.07	3.32	
6	Baseline SUV max Node(TC)	48	8.88	4.69	p<0.00001
	SUV max3 Node(TC)	48	6.31	4.04	

Table 4: Response evaluation as per PERCIST criteria :

Response evaluation of Loccally advanced & metastatic Head-Neck Squamous Cell Carcinoma patients undergoing Chemotherapy as per PERCIST criteria



PERCIST Response evaluation	TUMOUR SUV max						NODE SUV max					
	1st response evaluation (DCF+TC)		2nd response evaluation (DCF+TC)		3rd response evaluation (TC)		1st response evaluation (DCF+TC)		2nd response evaluation (DCF+TC)		3rd response evaluation (TC)	
	n	%	n	%	n	%	n	%	n	%	n	%
Complete Response	0	0.00%	0	0.00%	0	0.00%	1	1.28%	1	1.28%	0	0.00%
Partial Response	31	39.74%	43	55.13%	27	56.25%	26	33.33%	43	55.13%	30	62.50%
Stable Response	45	57.69%	29	37.18%	15	31.25%	42	53.85%	27	34.62%	13	27.08%
Progression of disease	2	2.56%	6	7.69%	6	12.50%	9	11.54%	7	8.97%	5	10.42%
Total no. of patients	78	100%	78	100%	48	100%	78	100%	78	100%	48	100%

CONCLUSIONS

PET-CT metrics SUV max detects metabolic response in the primary tumour and regional lymph nodes in advance head and neck squamous cell carcinoma during chemotherapy as early as 2 week with clinical correlation . It has a potential role as surrogate marker for treatment response evaluation and tailoring of the management of squamous cell carcinoma of

Clinical trial identification

Editorial acknowledgement

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A CASE OF LARGE CHONDROSARCOMA OF CHEST WALL

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Background

Neoplasms of chest wall comprise a varied group of tumors ranging from those primarily arising from the chest wall or due to involvement of the chest wall by direct invasion from adjacent cancers or from metastasis. These neoplasms account for <5% of thoracic malignancies and exhibit a varied pathology, as they can arise from any soft tissue or bony structure around the thoracic cavity.(1) Chondrosarcomas are low grade cartilage forming malignant tumors which arise from metaphysis most commonly in bones of the axial skeleton (pelvis, scapula, sternum, and ribs). They account for about 20% of all primary malignant tumors of the bone. Primary or conventional chondrosarcoma arises in pre-existing normal bone and is distinguished from the rarer secondary tumors, which occur in a pre-existing enchondroma or osteochondroma [2].The primary treatment modality of chondrosarcoma is surgical excision. [3]. Radiation therapy can be used after incomplete resection of high risk chondrosarcomas where surgical resection is challenging or limited. Chemotherapy has a limited role, with some use indedifferentiated chondrosarcomas.(4) Resection of chest wall tumor and reconstruction is a challenging procedure requiring a multidisciplinary approach which includes inputs from oncosurgeons, plastic surgeons and thoracic surgeons. Here we describe a case of chest wall chondrosarcoma which required wide local excision including 4 ribs with polypropylene mesh reconstruction with optimum post operative results.

Case Presentation

A 40 year old male patient presented in surgical oncology OPD with swelling over right chest wall since 8 months. The swelling was initially small and grew to the size of about 15×15 cm gradually over the time. It was not associated with pain or fever. There was no history of trauma. Patient had history of excision of chondrosarcomas of left forearm, right arm, right leg and left thigh in the childhood. Family history was not significant. Contrast enhanced CT scan of the chest showed 13×12 cms lobulated heterogenous hypo dense minimally enhancing mass around anterior bony and cartilaginous segments of right 7th and 8th ribs with arc like calcifications and cystic spaces. Large excrescences were seen from the bony segments of affected ribs. Lesion was projecting into the abdominal perihepatic space with indentation over the liver. Infiltration was noted in anterior basal pleural space. Intercostal muscles were involved with no involvement of underlying organs. The scan also revealed multiple osteochondromas arising from both the scapulae, 5th rib and spinous process of C7 vetebra. USG guided core cut biopsy of the mass showed chondroid neoplasm favoring chondrosarcoma. Under general anesthesia in left lateral position, a transverse incision was made over the swelling and wide local excision of tumor along with portion of6-9 ribs (4 ribs) and a part of hemidiaphragm was done. After excision, the peritoneal cavity and pleural cavity were connected through a large defect in the diaphragm. A 30×30 cm prolene mesh was placed over the entire defect of the chest wall with 5 cms extension beyond the defect edges in all direction. The edges of the diaphragmatic defect were sutured to the internal surface of the mesh with interrupted prolene 1-0 sutures in a tension free manner thus compartmentalizing thoracic and abdominal cavity.Omentum was sutured to the undersurface of diaphragm covering the liver and other abdominal contents. The mesh was fixed over the chest wall and abdominal wall with tackers and the wound was closed. Right side abdominal drain and right side ICD were placed which were removed on 4th and 9th post operative day respectively. Post op recovery of the patient was uneventful. He had no post op seroma or winging of scapula and had full range of motion at the shoulder. The patient was discharged after 7 days. Final histopathological report of the tumor showed unifocal tumor measuring 17×16×10 cms involving external and internal aspect of right anterior chest wall with 4 ribs(6-9). All the resection margins were free. Microscopy revealed low grade chondrosarcoma, grade 1. Mitotic count was sparse and necrosis or lymphovascular invasion was not seen. Pathologic stage was pT2 and type of resection was R0. The case was further discussed in tumor board.In view of complete resection with clear margins and histology, only observation was advised and considered.

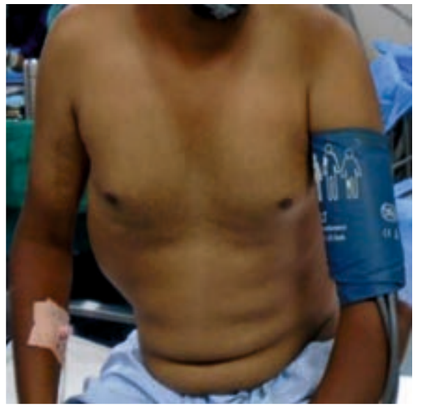

Fig. 1 Clinical photograph

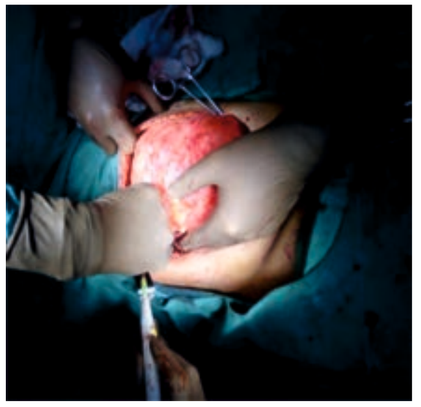

Fig. 2 Wide local excision being performed

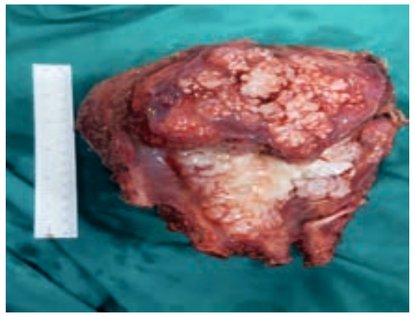

Fig. 3 Resected specimen inner surface

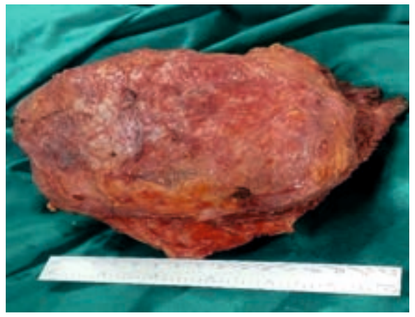

Fig. 4 Resected specimen outer surface

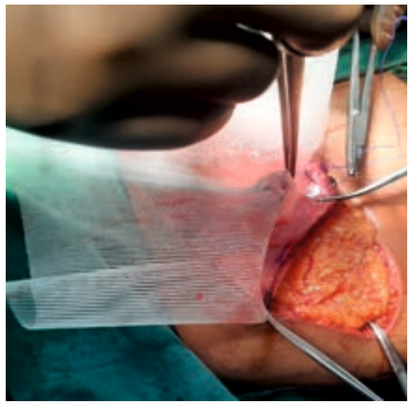

Fig. 5 Fixation of mesh to the diaphragm and chest wall

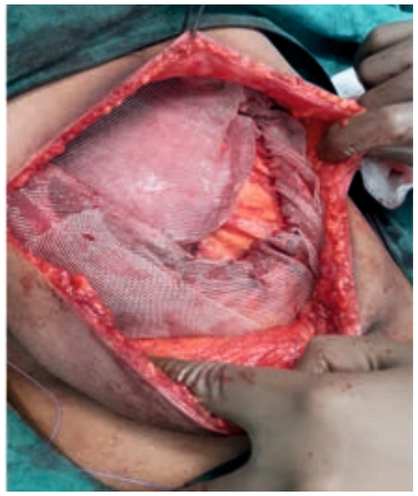

Fig. 6 Final fixation of the mesh extending beyond the defect and compartmentalizing thorax from abdomen

Discussion

Chondrosarcomas are the most common primary malignant chest wall tumors, accounting for almost 40% of primary chest wall sarcomas. (5)In addition to arising de novo, chondrosarcoma can arise secondary to benign underlying lesion, such as enchondroma or osteochondroma.(6) Ollier's disease and Maffucci's syndrome are conditions that cause noncancerous bone growths (enchondromas) in the body. These growths sometimes transform into chondrosarcoma. In Ollier disease (multiple enchondromas), the incidence of malignancy (most commonly chondrosarcoma) is approximately 25% by the age of 40 years, and in patients with Maffucci syndrome (multiple enchondromas with soft-tissue hemangiomas), the incidence may be even higher.(7)Resection with tumor free negative margins is the primary modality of treatment for chondrosarcomas. With wider resections being performed, newer reconstruction techniques using prosthetics and bioprosthetics have evolved significantly. Reconstruction of the skeletal and soft tissue defect with feasible respiratory and functional outcome is important for overall long term result. There is a general consensus among surgeons that defects more than 5 cm and situations where more than 4 ribs are resected, chest wall reconstruction should be performed. This is to provide adequate protection to the internal organs, to obliterate the dead space, to prevent respiratory compromise due to paradoxical motion of the chest wall and to prevent lung herniation. Several methods have been used for the reconstruction like use of polypropylene or PTFE meshes, methyl methacrylate sandwiched between two layers of meshes, titanium plates and allograft or homograft materials etc. In this case a PTFE mesh could have been used but due to cost constraints a polypropylene mesh was used.

Conclusion

Chest wall tumors often necessitate massive resections to obtain a tumor free margin which require reconstruction of both skeletal and soft tissue defect. Achieving both the objectives is very important for the overall prognosis and enduring functional capacity of the patients. Resection and reconstruction of the chest wall tumors is a technically demanding procedure with requires a multidisciplinary team including cancer surgeons, plastic surgeons and oncologists. Novel and evolving techniques of chest wall reconstruction have been allowing surgeons to perform more aggressive and complete resections of chest wall tumors with long term favourable outcomes.

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Ovarian transposition: an effective surgical option for fertility preservation

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Introduction:

With increasing overall survival, many cancer patients will be confronted with long-term morbidity, among which impaired gonadal function and fertility can have important psychosocial consequences.

It is important, to consider and discuss these issues, before the start of gonadotoxic treatments (chemo-/radiotherapy).

Although ovarian transposition has been described since 1958, the number of eligible patients being offered this procedure remains low. Laparoscopic/Open ovarian transposition is an under-utilized, yet fairly simple surgical procedure to relocate the ovaries away from the radiation field and preserve ovarian function. It is indicated for patients with tumors requiring pelvic radiation in doses much higher than those that can induce loss of ovarian function(4-20 Gy).

Several studies have reported results of ovarian transposition in preservation of ovarian function and fertility but only few studies published long term follow up. Overall the success in preservation of ovarian functionality seems to be located between 60 and 80%.1,2,3

We describe ovarian transposition its indications, technique and outcomes in the context of ovarian function and fertility preservation.

Method:

A retrospective review was done of all patients that underwent laparoscopic or open ovarian transposition from 2017 to 2021 at our tertiary care cancer centre. Total 8 patients underwent ovarian transposition. 4 patients had open while 4 patients had laparoscopic ovarian transposition. Normal ovarian function was defined by the absence of vasomotor symptoms, AMH and/or menstrual history.

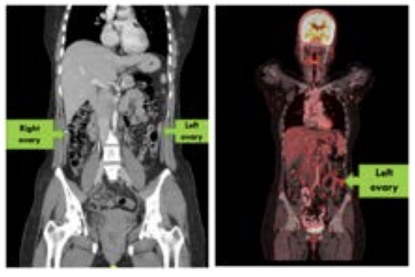
Technique:

Laparoscopic ovarian transposition:

The peritoneum was insufflated with CO_2 gas. Four ports were placed for the procedure, a 10 mm umbilical and 10 mm suprapubic port with 5 mm right and 5 mm left mid quadrant ports. Beginning on one side, the fallopian tube was separated and the utero-ovarian ligament was cauterized and divided. The retroperitoneum was opened and the ureter was identified. The infundibulopelvic ligament was mobilized along its entirety with a vessel sealer/divider. Ovary along with its blood supply was then passed through the peritoneal tunnel created in the paracolic gutter and brought out at the upper end after mobilization of the colon. The ovary was fixed intraperitonealy to the lateral abdominal wall by taking suture through the ovarian ligament. Radio opaque ligacips were then applied at the upper end of transposed ovaries to mark their site during radiation. Care was taken to avoid torsion of pedicle.

Results:

Sr. No	Age (y.)	Diagnosis	Pre-operative menstrual history	Treatment received		Post operative findings			Post operative follow up (months)	Status
				Ovarian transposition	Radiation Technique and dose	Menstrual history	Vasomotor symptoms	AMH		Alive without disease
1.	12 Y.	Ewing's sarcoma	Pre-menarchal	Laparoscopic Bilateral	IMRT+IGRT 45gy/36 cycles	Regular cycles	No	0.39	21.m	Alive without disease
2.	12 Y.	Ewing's sarcoma	Pre-menarchal	Laparoscopic Bilateral	IMRT+IGRT 45gy/36 cycles	Regular cycles	No	0.02	30.m	Alive without disease
3.	14 Y.	Ewing's sarcoma	Pre-menarchal	Laparoscopic Unilateral left	3DCRT 45gy/25 cycles	Regular cycles	No	0.67	14.m	Alive without disease
4.	32 Y.	Ca Rectum	Regular cycles	Laparoscopic Bilateral	3DCRT 50_4gy/28 cycles	Regular cycles	No		13.m	Alive without disease
5.	33 Y.	Ca Cervix Stage 2a	Regular cycles	Open Bilateral	3DCRT 50_4gy/28 cycles+brachy therapy	Hysterectomy done	No		15.m	Alive without disease
6.	34 Y.	Ca Cervix Stage 2a2	Regular cycles	Open Bilateral	3DCRT 50_4gy/28 cycles+ brachytherapy	Hysterectomy done	No	0	20.m	Alive without disease
7.	36 Y.	Ca Cervix Stage 1b1	Regular cycles	Open Bilateral		Hysterectomy done	No	1.6	30.m	Alive without disease
8.	36 Y.	Ca Cervix Stage 1b1	Regular cycles	Open Bilateral		Hysterectomy done	No		59.m	Alive without disease



6 out of 8 patients received post-operative external beam radiation to the pelvis (45–50.4 Gy). Two received additional brachytherapy. Median age was 32 years (12–36), and median follow up was 26 months (13-59). AMH was normal in 4/5 patients. Menses continued post-radiation in all (4/8) women who retained their uterus. No patient reported vasomotor symptoms(0/8).

Surgical morbidity and estimated blood loss was minimal. All laparoscopic ovarian transposition patients were discharged next day. Open ovarian transposition was done only for those patients who underwent radical hysterectomy for ca cervix and needed a median stay of 5 days. One patient presented with ovarian cyst of 5 cm size on imaging without any symptoms. No patient experienced disease recurrence.

Discussion:

The results of ovarian transposition before radiotherapy depend on various factors and are, therefore, difficult to quantify. Ovarian tissue is sensitive to radiation and as the age of the patient increases, smaller doses of radiation to the ovaries cause ovarian failure.

The success rate of ovarian transposition is also determined by the surgical technique and the distance from the radiation field. It is important, since 10% of the radiation dose is still active at a distance of 10 cm from the radiation field.4 Therefore ovary should lie at least 2 cm above the iliac crest.5 In addition, a safety margin of approximately 2 cm is included, because the position of the ovaries can change postoperatively.[6]

The surgical risk of ovarian transposition is low. In most cases, the procedure is possible via laparoscopy. If laparotomy is performed because of another indication, ovarian transposition can be carried out simultaneously without a substantial increase in the complication rate. Ovarian tissue can also be removed during this procedure for cryopreservation. Ovarian cysts sometimes develop postoperatively which are a sign of disturbed ovarian function.[4] In most cases, however, these cysts do not require treatment.

The main limitation of our study is that it was retrospective; therefore AMH levels were not available for all patients. In our study none of the patients reported vasomotor symptoms. Also all three premenarchal girls started regular menses even after full dose of pelvic RT.

Conclusion:

Laparoscopic ovarian transposition is a safe and effective technique of ovarian protection from the gonadotoxic effects of pelvic radiation. It does not delay primary treatment and does not compromise oncological outcomes.