

PRINCIPLES OF CARE FOR PATIENTS INVOLVED IN FRACTURE AND MULTIPLE TRAUMA PATIENTS IN OPERATING ROOM AND HOSPITAL: THE ORIGINAL ARTICLE

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Abstract

Any kind of blow, injury, shock, damage and accident inflicted on the body is considered trauma in medical science, provided that it is inflicted on the body from the outside and the internal factor is not the cause of the injury. In other words, trauma. It is any injury caused by the increase of energy input to the body. This energy may be impact, mechanical, thermal (burn), chemical or other types. Spine fracture is one of the severe injuries that can happen. In such a situation, the vertebra of the spine, which is rectangular in shape, will be compressed. This case is caused by severe traumas such as an accident or falling from a great height, but it can also be caused by osteoporosis and weakening of the bones in old age. In fact, a person who has suffered a number of blows and accidents is called multiple trauma. For example, a person who suffers a fracture, bleeding, vascular damage, amputation, etc. in an accident is a multiple trauma patient. Patients who suffer from multiples need specialized first aid and measures. According to the law, first treatment is very vital in multiple cases, depending on the place of creation, the method of providing aid is different. The way of moving the patient, the injured area, closing and transferring it, preventing possible bleedings, etc. are among the effective and decisive factors in this stage. Timely treatments prevent more and more severe injuries to the patient. Nursing in trauma is very important and effective. First, the injured person should be examined and evaluated thoroughly to determine the exact location of the trauma. Then, according to the type and level of injury, first aid should be given in trauma emergency rooms. But when it comes to mental trauma nursing, it is not only the person's body that is important. The patient should be treated appropriately. A trauma nurse should be more or less familiar with the science of psychology, the details of emotional relationships, and have great patience, because the person standing in front of him may have lost the dearest person in his life.

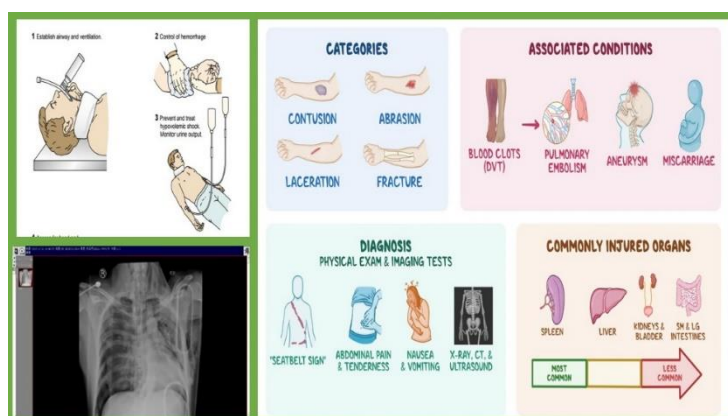
Keywords: Principles of Nursing Care, Fractured Patients, Multiple Trauma, Bone.

Introduction

Mental trauma in the meaning of the word means encountering or being in a very special and painful situation, which is a very sudden experience and the person has no preparation to deal with it. From the medical point of view, this shock or psychological trauma is very dangerous because a person may suffer a stroke or even paralysis as a result of it [1-3].

Mental trauma is actually much harder and deeper than physical trauma that is inflicted on a person. At this stage, an unexpected event or even a very inappropriate behavior on the part of another person may cause such damage to a person that an irreparable blow is inflicted on him. The trauma room is the first place and actually the most important place for a trauma patient. Because the best treatments may be done in the first few hours after the accident or illness. For this reason, all basic equipment and tools for resuscitation or other trauma emergency aid should be available (Figure 1). The existence of a triage room, CPR, etc. are other requirements [4-6]. A room should have complete equipment in a treatment department. Quality control and health assurance and the use of tools and equipment should also be done daily. Colleagues working in this department must fully know how to use the equipment and how to deal with the equipment so that they do not get into trouble at the moment and try to improve the patients with high skill and self-confidence [7].

Figure 1. Nursing Care for Patients Involved in Fracture and Multiple Trauma



Instructions for the correct use of the devices must be installed on them. Access to communication channels and telephone lines should be available for everyone. Mental trauma in the meaning of the word means encountering or being in a very special and painful situation, which is a very sudden experience and the person has no preparation to deal with it. From the medical point of view, this shock or psychological trauma is very dangerous because a person may suffer a stroke or even paralysis as a result of it [8-10].

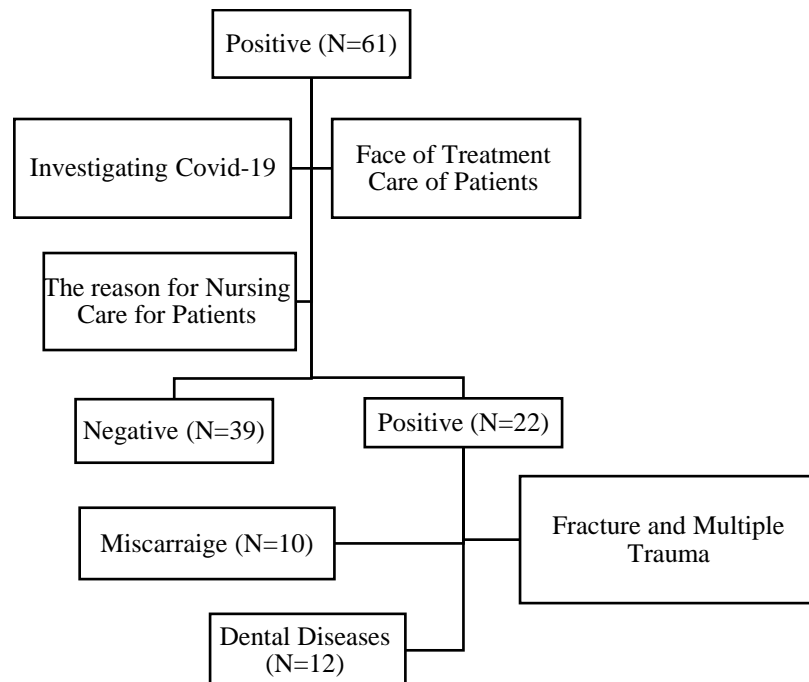
Mental trauma is actually much harder and deeper than physical trauma that is inflicted on a person. At this stage, an unexpected event or even a very inappropriate behavior on the part of another person may cause such damage to a person that an irreparable blow is inflicted on him. Vertebral fracture is a very uncommon problem that occurs due to various factors. Lumbar fracture due to an accident can be very mild or severe and is accompanied by symptoms such as shooting pain, numbness and weakness in the back, inability to move, loss of height or changes in the structure of the back, etc., and requires an immediate visit to a doctor [11-13].

Fracture of the spine is a relatively uncommon problem due to several factors such as osteoporosis, imposing a lot of pressure during lifting heavy objects or sports injuries, and severe direct blows to the spine due to accidents and traffic accidents [14].

Search strategy and selection of articles

Search in Scopus, Google scholar, PubMed databases and by searching with keywords such as "Nursing Care for Patients" and "Covid-19" and "Fracture and Multiple Trauma" to obtain articles related to the selected keywords [7]. Case report articles, editorials, and articles that were not published or only an introduction of them were available, as well as summaries of congresses and meetings that were in languages other than English, were ignored. Only the original research articles that evaluated the effectiveness of different drugs in the treatment of COVID-19 using standard methods were studied (figure 2).

Figure 2. Flow chart of included subjects



Types of fractures in the vertebrae of the spine

Lumbar fractures can be separated and divided into pathological and non-pathological (also known as traumatic) according to the state of the fracture and its cause [15].

Pathological fracture of the lumbar vertebra: Pathological fractures occur when the bone tissue of the lumbar vertebrae as a result of diseases, bone deficiencies or other underlying disorders, they have become weak, vulnerable and fragile. Problems and disorders such as bone tumors or cysts, osteomyelitis or bone infection, osteoporosis, osteogenesis imperfecta or brittle bone disorder, multiple myeloma disease or multiple myeloma and other such diseases and disorders lead to bone fragility and vulnerability [15].

Lumbar traumatic fracture (non-pathological): non-pathological fractures occur in healthy bones that are not pathological. These types of fractures are caused by trauma. Traumas such as sports accidents, car accidents, falling from a height, direct impact [6].

Spinal fracture signs and symptoms

Mild to severe pain is the most common symptom of a spinal fracture, and the pain worsens when working and moving. If the spinal cord is involved, the patient may experience symptoms such as intestinal and bladder dysfunction, as well as numbness in the legs. Spine fracture can be caused by weakened bones, osteoporosis, tumor, or certain medical conditions. In such a situation, even a small pressure on the vertebrae can cause a fracture of the spine [17].

The purpose of spine fracture surgery is:

- Returning the bones to their original position;
- Relief of pressure on the spinal cord and nerves;
- Improve range of motion.

Some bone tumors are cancerous (malignant). Malignant bone tumors can metastasize. (They cause cancer cells to spread throughout the body.) In most cases, treatment for malignant tumors is a combination of chemotherapy, radiation therapy, and surgery. Bone tumors can affect any bone in the body and grow in any bone (from the surface of the bone to the center of the bone, which is called the bone marrow) [18].

A growing tumor (even a benign tumor) destroys healthy tissue and weakens the bone, making it more vulnerable to fractures. When a bone tumor is cancerous, it is either a primary or secondary bone cancer. A primary bone cancer has started in the bone while a secondary bone cancer has started elsewhere in the body and then spread by metastasizing to the bone. Secondary bone cancer is also called metastatic bone disease.

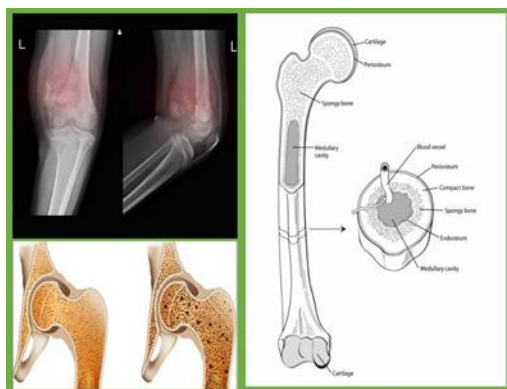
Primary bone cancer

The four most common primary bone cancers include:

➤ Multiple myeloma

Multiple myeloma is the most common primary bone cancer. This cancer is a malignant cancer of the bone marrow (the soft tissue in the center of many bones that produces blood cells). Any bone in the body can suffer from this cancer. Multiple myeloma affects approximately 6 out of every 100,000 people every year [19]. According to the statistics of the National Cancer Institute, almost ninety thousand people are living with this disease every year (Figure 3). Most patients are seen between the ages of 50 and 70. Multiple myeloma is usually treated with chemotherapy, radiotherapy and in some cases with surgery.

Figure 3. Bone Cancer



➤ **Osteosarcoma**

Osteosarcoma is the second most common primary bone cancer. Every year, two to five people in a population of one million are infected with this disease, most of these patients are children and teenagers [20]. Most tumors grow around the knee and in the femur (thigh) or tibia (leg) bones. Other common areas include the hip and shoulder. Osteosarcoma is usually treated with chemotherapy and surgery.

➤ **Ewing's sarcoma**

Ewing's sarcoma usually occurs in people between the ages of 5 and 20. The most common areas involved include the thigh, leg, pelvis, arm, and ribs. Ewing's sarcoma is usually treated with chemotherapy and surgery or radiotherapy.

➤ **Chondrosarcoma**

Chondrosarcoma is a malignant tumor consisting of cartilage-producing cells. This disease is more common in people between the ages of 40 and 70. It mostly occurs in the hip, hip or shoulder joints. Surgery is the only treatment used for chondrosarcoma [21].

Benign bone tumors

There are different types of benign bone tumors, as well as some diseases can evoke a bone tumor when in fact, they are not a bone tumor and, in many cases, they require the same treatment as a tumor.

Some common types of benign bone tumors and other diseases that are grouped with tumors include the following:

- Non-osseous fibroma;
- Monochromatic bone cyst (simple);
- Osteochondroma;
- Giant cell tumor;
- Enchondroma;
- Fibro dysplasia;
- Chondroblastoma;
- Aneurysmal bone cyst;
- Osteoid osteoma.

Causes of benign bone tumors

The causes of most bone tumors are unknown.

Symptoms of benign bone tumors

Patients with bone tumors usually feel pain in the tumor area. The pain is typically described as a dull, shooting pain that may be worse at night and may sometimes worsen with activity. Other symptoms of bone tumor can include fever and night sweats. Although bone tumors are not caused by trauma or injury, an injury can cause the tumor to start bothering a person [22]. The injury can also cause a bone weakened by a tumor to break or dislocate.

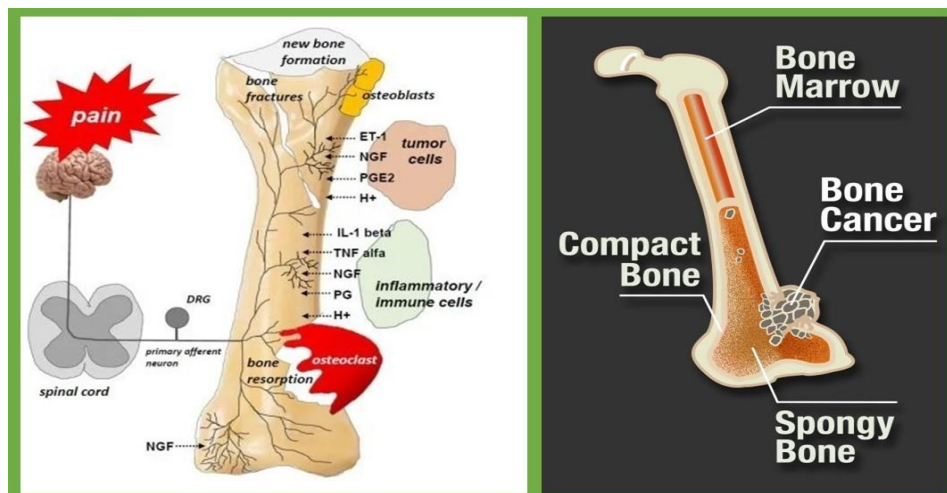
This can be extremely painful. In some cases, a benign tumor may be discovered accidentally when radiographs are taken for another reason, such as a knee injury or ankle sprain.

Bone tumor and bone cancer tests

➤ Radiology photo

A radiograph provides a picture of dense structures such as bone. In most cases, your doctor will order radiographs to help diagnose a bone tumor. Different types of tumors may look different on radiology. Some tumors destroy the bone and some create a cavity in it. Others cause extra bone formation.

Figure 4. Bone tumor and bone cancer tests



Tumor of the femur (thigh bone): This radiograph shows a tumor that has caused a saucer-shaped erosion at the end of the femur. The side image shows the same tumor using a cross-sectional MRI image.

Tumor of the femur (thigh bone): This radiograph shows a tumor in the middle of the femur. This tumor can also be seen on MRI [23].

Humeral Tumor and Fracture: This radiograph shows a fracture from a tumor in the middle of the humerus.

Sampling

It may be necessary to take a sample to confirm the diagnosis of bone tumor. In a biopsy, a tissue sample is removed from the tumor. This sample is tested and analyzed under a microscope by a pathologist (a doctor who diagnoses diseases by studying abnormal cells).

There are two main methods of sampling:

- **Needle sampling:** In this procedure, you will be given a local anesthetic. Your doctor will then insert a needle into the tumor to remove tissue. Needle sampling is usually done in the doctor's office. In some cases, a radiologist will perform a needle biopsy. In this case, an imaging like X-ray, CT Scan or MRI is used to guide the needle.
- **Open sampling:** In this procedure, sampling is done in an operating room. After you are put under general anesthesia to put you to sleep, your doctor will make a small incision to remove some of the tissue.

Treatment of bone tumor and bone cancer

➤ **Benign tumors:** If your tumor is benign, your doctor may recommend only close monitoring to see for changes. During this time, you may need periodic follow-ups with radiographs and other tests. Some benign tumors can be treated well with medicine. Some disappear over time. This is especially true for some cancers that occur in children, such as osteoid osteoma.

➤ **Malignant tumors:** If you have bone cancer, treatment involves a team of doctors from different specialties working together to provide the care you need. Some of them will be oncologists (cancer treatment specialists). Your treatment team may include an orthopedic oncologist, oncologist, radiation oncologist, radiologist, and pathologist. The goal of treatment is to cure cancer and maintain the function of every organ affected by cancer in the best possible state. Treatment depends on several factors, including the stage of the cancer. If the cancer is confined to one location, there are cancer cells within the tumor and the surrounding area. When the cancer reaches the metastasizing stage, it has spread to other parts of the body and may be more serious and difficult to treat [24-26]. Doctors usually combine different treatment methods to treat malignant tumors:

➤ **Radiotherapy:** Radiotherapy uses high-dose X-rays to kill cancer cells and shrink the tumor. This method is only used to treat cancer exposed to radiation and does not treat cancer in other areas.

➤ **Chemotherapy (systemic treatment):** Chemotherapy is usually used to kill tumor cells when they have entered the bloodstream but cannot yet be found using scans and tests.

In general, chemotherapy is used when the cancerous tumor has a very high probability of spreading. Chemotherapy is usually given intravenously (injected into a vein) or as a pill or capsule that is swallowed. Generally, malignant tumors are removed by surgery. Most of the time radiotherapy and chemotherapy are used as combined treatment with surgery [27].

Osteoma

It is a benign bone tumor that appears as a bump with smooth sides on smooth or long bones. This tumor is formed from dense or spongy bones and does not require treatment if it does not cause discomfort to the patient. If it causes discomfort for the patient or there are problems in terms of aesthetics, the tumor must be surgically removed [28].

Osteoid osteoma

It is a benign lesion that is mostly seen in children and teenagers under the age of 25 and affects most of the lower limb bones. Pain is the most important symptom of this tumor. The pain is often worse at night and is relieved by aspirin and other non-steroidal anti-inflammatory drugs. Osteoid osteoma in the spine usually causes scoliosis. Most doctors believe that the tumor should be removed by surgery or destroyed by radiofrequency or radiation therapy [29].

Osteoblastoma

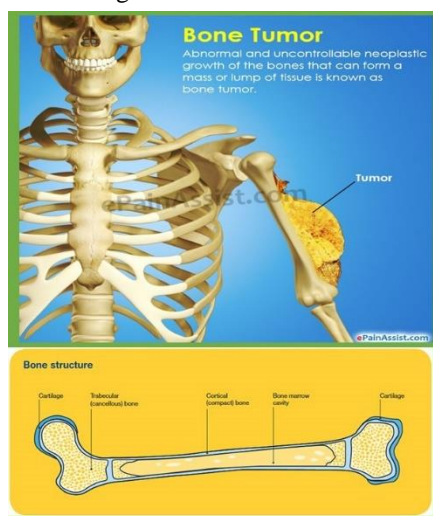
It is a tumor more or less similar to osteoid osteoma, with the difference that it is bigger than it (the diameter of the focus is more than 2 cm). These patients complain of pain, but its intensity is less than osteoid osteoma. Treatment is performed by surgical removal of the tumor and, if necessary, bone grafting [30].

Osteochondroma or exostosis

It is one of the most common bone tumors in teenagers, which increases with bone growth and stops growing after puberty. The tumor is mostly seen in long bones, especially in the lower limbs. These patients usually do not have pain [31]. Sometimes the enlargement of the tumor puts pressure on the nearby peripheral nerve, causing pain, numbness, tingling and sometimes paralysis. Trauma may cause its fracture and pain. This tumor is rarely malignant. In case of pain or enlargement after stopping the growth, malignancy should be suspected and the tumor should be removed. In case of malignancy, osteochondroma turns into chondrosarcoma [32].

In case of suspicion of malignancy, the cartilage cap of osteochondroma is measured with the help of MRI, and if its size is more than 10 mm, it is considered malignancy. Tumors without clinical symptoms do not need special treatment and should be monitored.

Figure 5. Osteoblastoma



Surgery is considered if:

- Enlargement after growth stops;
- Become painful;
- Pressure symptoms on nerves and blood vessels;
- Adjacent joint dysfunction.

The Chondroma

A benign cartilage tumor is a mass of cartilage with a well-defined wall inside the bone. The most common location of this tumor is the long bones of the hands and feet. Chondroma, which is mostly seen in young people, has a slow growth and gradually causes thinning of the bone membrane. Cartilaginous tumors that are found in the hands and feet are benign in almost all cases, but the tumors of the roots of the organs, tumors of the humerus, thigh, and pelvis, may turn into chondrosarcoma [33-35]. Malignancy of the tumor is usually after the age of 30, and its most important symptoms are enlargement and pain. The treatment of this tumor is to shave the cartilaginous tissue and fill the cavity with bone graft.

Benign chondroblastoma (Codman's tumor)

Chondroblastoma is a benign tumor that occurs in the long bones of the body. Tumors are more common in young people before the growth plate closes. Draining the cavity and filling the resulting cavity with cancellous bone is a suitable treatment.

Non-ossifying fibroma

It is mostly seen in long bones, especially in the lower limbs. This tumor is a harmless and asymptomatic lesion in children and adolescents and is mostly discovered by accident. In most cases, observation of the patient is sufficient. Only in cases where the lesion is suspicious or the size of the tumor is large and there is a risk of morbid fracture, the tumor should be treated with curettage and bone grafting [36].

Bone cyst

It is a benign lesion that is mostly seen in long bones, especially the upper end of the femur and arm. There is mild pain and discomfort, and it is often diagnosed accidentally after a pathological fracture or during radiography [37]. The place where the cyst is formed is under the growth plate. The bone cyst usually contains clear or amber colored liquid. Bone cyst treatment is done with one of the methods of bone graft replacement or intra-cyst corticosteroid injection. If the cyst causes a bone fracture, the fracture should be treated first, and if the cyst remains, the cyst should be treated as well. Because in many cases, after the fusion of the fracture, the cyst fills by itself.

Aneurysmal cyst

It is a benign lesion that is in the form of dilated cavities that are filled with blood. The spine, pelvis, and thigh are the most common sites of the disease. It is mostly seen in teenagers. It may manifest itself with pain or in the form of bone enlargement and deformation or pathological fracture and paraplegia due to spinal cord infection. In cases where the lesion is available, tumor drainage and filling it with spongy and dense bone is the elective procedure [38]. In cases where the lesion is not available or surgery is not possible, radiotherapy is recommended.

Osteoblastoma

Locally, it causes bone corrosion and destruction, and it rarely affects more distant places. The tumor affects mostly adults between 15 and 35 years old and is rarely seen before the growth plate is closed [39]. This tumor is seen in most cases in long bones. In 50% of cases, the tumor affects the knee area (the lower end of the thigh bone and the upper end of the leg bone). This tumor rarely metastasizes and the most common site of metastasis is the lung. The treatment of this tumor is surgery [40]. If the lesion is limited to the bone and the bone wall is healthy, shaving the bone and filling it with spongy bone is usually sufficient. Some, due to relatively high tumor recurrence (20-40%) after removing the tumor and scraping its wall, they burn the remaining walls chemically and surgically and then fill it with spongy bone removed from the pelvis. In cases where the tumor is not limited to the bone and has torn its wall, all the tumor and adjacent cartilage and bone are removed and a bone graft or joint replacement is performed.

Osteogenic sarcoma

It is the most common primary bone malignancy in children and adolescents. This tumor often starts from long bones and its most common location is the lower end of the femur bone and the upper end of the tibia bone. The pain gradually increases and becomes permanent. The rapid growth of the tumor causes the loss of bone, and after

tearing the bone membrane, it invades the surrounding tissues. The treatment includes chemotherapy before surgery and then complete removal of the tumor and chemotherapy after surgery.

Chondrosarcoma

Its origin is chondrocytes. The most common bone tumor of the hip and shoulder is after multiple myeloma. This tumor is for adults and the elderly and is often seen in people over 30 years old. This tumor has a slow growth and pathological fractures are less common. This tumor is resistant to chemotherapy and radiation therapy and only surgical treatment is possible for it [41].

Ewing's sarcoma

It is an extremely malignant bone tumor. Generally, after multiple myeloma and sarcoma, osteogenic is the most common malignant bone tumor, but in children it is the second primary bone malignancy in terms of prevalence. This tumor mostly affects the hips and thighs of children and teenagers. The tumor starts from the bone marrow and gradually destroys the bone tissue from the inside. The pain gradually becomes intense and permanent and reaches its maximum at night.

The general condition of the patient is also unfavorable. This tumor is extremely malignant and quickly spreads to other parts of the body. The treatment of this tumor includes chemotherapy and sometimes radiotherapy.

Multiple myeloma

Multiple myeloma is the most common malignant bone tumor that originates from bone marrow cells. This tumor is more common in people over 40 years old. All bones may be affected, but spongy and broad bones such as hip bones and ribs, skull and vertebrae are more affected by this tumor [42]. The pain is intermittent at the beginning of the disease and manifests as constant pain at the end. Anemia, anorexia, weight loss, and fever are prominent symptoms of the disease. This tumor is sensitive to radiotherapy and radiotherapy should be combined with chemotherapy.

Tumor metastasis

Metastatic tumors are far more common than primary bone tumors and are usually seen from the age of 40 onwards. About two-thirds of metastatic tumors originate from breast and prostate cancers [43]. After these two, kidney, lung, thyroid and digestive tract cancers are the main source of metastatic tumors. The treatment of these tumors depends on the type of tumor and chemotherapy, radiation therapy or surgery may be suggested.

Complications and symptoms of lumbar vertebra fracture due to accident

Complications and symptoms of lumbar vertebra fractures due to accidents or other related factors depend not only on the severity of injuries but also on the severity of bone fractures. These fractures can be very mild, so that the person never notices them for a long time, or in some cases, the severity of these fractures can be very serious and dangerous, in such a way that the quality of life of the person is completely affected and disturbed.

In general, if the vertebrae of the lumbar spine fracture and show symptoms, the symptoms of a lumbar vertebrae fracture can be one or more of the following:

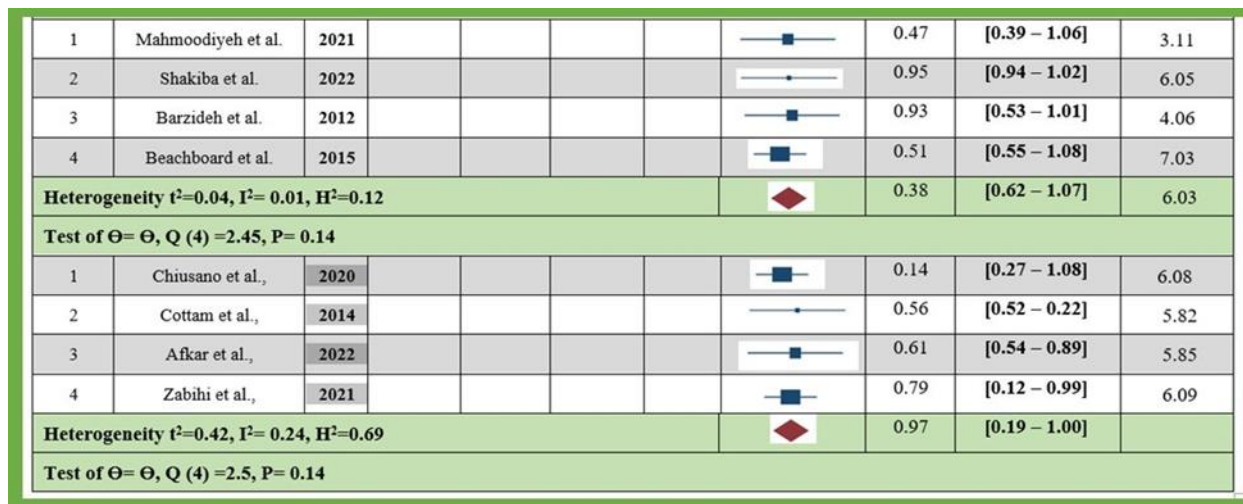
Accurate diagnosis of femur tumor in trauma

One of the most obvious symptoms of bone tumor is pain that is not relieved by taking medicine. For accurate diagnosis of bone tumors, a variety of conventional imaging methods or blood and urine tests are used (Figure 6 & 7). Through radiographic images, CT scan, radioisotope scan and MRI, it is possible to confirm the disease and its spread and progress in the patient's body. This information helps to choose the best treatment method by bone tumor surgeon and orthopedic specialist. Sampling of tissue infected with cancer for microscopic examination of the tissue helps to diagnose the type of cancer and the degree of invasion of cancer cells [44]. Sampling of tissues is sometimes done with open surgery and sometimes it is possible with the use of a special needle. When open surgery is used to take a sample from a cancerous mass, the skin is split up to the tumor site and a part of the tissue is taken for the pathobiology examination is sent to the laboratory [45-47].

Figure 6. Forest plot showed Nursing Care for Patients



Figure 7. Forest plot showed Fracture and Multiple Trauma



Types of bone tumors

Bone tumors are more common in the bones of the lower limbs such as the hip and thigh. Bone tumors may be caused by the transfer of the infected mass from other tissues by blood and lymph, or their primary origin is bone tissue, in which case it is called a primary bone tumor [48-50]. Bone tumors may be malignant or benign [51-53].

Conclusion

Trauma is actually an injury and loss caused by pressure or impact on the body. Accidents, being hit, falling, and injuries are among the causes of traumas. When a person has an accident, is injured, it is said that he is traumatized. Of course, it can be said that trauma is divided into two internal and external factors, and these two issues are determined in the emergency room and emergency medical centers according to the law of trauma. The term trauma in medical science includes any type of pressure that is applied to the human body, which is external to the body from this impact or pressure, and is actually a type of external factor. According to some sources, one of the causes of death in the world after heart attack is trauma, which is the third cause of death in Iran. Optimal monitoring of multiple trauma patients in the emergency room is still considered as a challenge.

There are various invasive and non-invasive methods for monitoring the hemodynamic status, which are effective on the clinical outcome of multiple trauma patients. Also, evaluation of trauma patients using FAST technique has been proposed as a valuable aid for emergency care of patients with abdominal trauma. One of the other important reasons for the unfavorable performance of emergency nurses in providing care to trauma patients is the lack of preparation, knowledge and relevant skills. Periodic assessment of the preparation of emergency nurses is necessary. The preparation of emergency nurses in caring for trauma patients was more than two-thirds of the total score and good. Nursing service managers should design and implement educational programs to strengthen the weaknesses of nurses and ultimately increase the quality of nursing care and the safety level of trauma patients.

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