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Best Practice Guide: Myeloma bone disease

This document is one of the Myeloma UK Nursing Best Practice Guides for the Management of Myeloma series. The purpose of this Guide is to enhance knowledge and inform nursing practice when caring for myeloma patients with myeloma bone disease. After reading this, you should be able to:

- Define myeloma bone disease
- Understand the cause, symptoms and consequences of myeloma bone disease
- Be aware of the clinical testing and assessment tools for myeloma bone disease
- Understand the treatment for myeloma bone disease
- Understand the nurse's role in the assessment, intervention and management of myeloma bone disease and in patient education about this complication

The information contained within this Guide should be used in conjunction with local policies, protocols and best practice guidelines in oncology.

Background

Myeloma bone disease is one of the most common and debilitating complications of myeloma.

Approximately 70% of patients have evidence of myeloma bone disease at the time of diagnosis [1] and some 90% of patients will have it at some point during the course of their myeloma [2].

Myeloma bone disease is caused by the disruption of the local bone microenvironment by the myeloma cells [3]. The resulting increase in osteoclastic and decrease in osteoblastic activity leads to bone being broken down (resorption) faster than it can be repaired [4]. Areas of bone become thinner and weaker and, as these lesions are purely osteolytic, they do not heal [5] and become prone to fracture.

Although lytic lesions may occur at almost any skeletal site, areas most commonly affected are those of active haematopoiesis such as the spine, ribs, pelvis, skull and the proximal long bones of the arms and legs [6].

The clinical consequences of myeloma bone disease include:

- Severe and unremitting bone pain
- Pathological fractures
- Vertebral collapse
- Spinal cord compression
- Hypercalcaemia

Key facts

- Myeloma bone disease is a central feature of myeloma affecting up to 90% of patients
- The consequences of myeloma bone disease involve skeletal-related complications which can greatly impact on quality of life
- Proper assessment of myeloma bone disease is critical to ensure appropriate treatment and management, particularly in newly diagnosed patients

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Some of these skeletal-related events can cause other complications such as poor circulation, breathing difficulties, muscle wasting and renal insufficiency.

The impact of myeloma bone disease can therefore be devastating. Quality of life is often compromised by pain, decreased mobility and inability to carry out day-to-day activities [7]. This, in turn, can cause psychological and emotional difficulties. Moreover, the extent of myeloma bone disease has a significant influence on survival [8].

Therefore, early detection and thorough skeletal assessment are essential so that the most appropriate management for each patient can be initiated as soon as possible.

The following describes the general medical approach to the treatment of myeloma bone disease, and provides best practice guidance for nursing interventions and nursing management of patients with myeloma bone disease.

General recommendations:

- A multidisciplinary approach to the management of myeloma bone disease is recommended
- Supportive care aimed at treating, reducing and preventing myeloma bone disease should form an essential part of myeloma treatment
- Signs and symptoms of hypercalcaemia should be recognised so that immediate treatment and management can be instigated
- Signs and symptoms of spinal cord compression should be recognised as a medical emergency and be managed immediately

Nursing recommendations:

- Intravenous bisphosphonates should be administered safely and patients on oral bisphosphonates should be informed of the importance of complying with treatment
- Patients should be monitored for any side-effects of bisphosphonates
- The ability of patients to perform activities of daily living should be assessed and monitored on a continual basis
- Imaging investigations should be explained and patients should be prepared for these tests
- Strategies should be provided to prevent or reduce the side-effects of supportive treatments such as radiotherapy
- The effects of analgesia should be monitored and patients should be educated about potential side-effects
- Patients and their families should be informed and educated about myeloma bone disease, how to prevent complications and maintain optimum bone health

Medical approach

The general medical approach to the treatment and care of patients with myeloma bone disease is described as follows and may involve referral to orthopaedic and/or neurosurgeons, radiologists, pain specialists, physiotherapists and other allied healthcare professionals.

Assessment

Blood

The accelerated bone resorption that occurs in myeloma bone disease leads to the release of calcium from the bone into the blood. Elevated serum calcium (normal corrected level 2.2 – 2.6 mmol/L) therefore provides a useful indicator of active myeloma bone disease which is typically seen in up to 30% of myeloma patients at diagnosis.

An assessment of any symptoms of hypercalcaemia should be made. The most common symptoms include:

- Loss of appetite
- Fatigue/weakness
- Excessive thirst/urination
- Mental confusion
- Acute renal insufficiency

Severe hypercalcaemia (corrected level ≥ 3.5 mmol/L) is classed as a medical emergency and requires immediate treatment.

Bone

It is recommended that all patients undergo a full skeletal assessment at diagnosis to determine the presence and extent of myeloma bone disease [9]. Further assessments may also be carried out during the course of the myeloma to measure the skeletal impact the myeloma may have, for example, at relapse.

Myeloma bone disease is primarily assessed by conventional radiography (X-ray) but under certain circumstances computerised tomography (CT) scanning and/or magnetic resonance imaging (MRI) may also be used.

X-rays

A series of X-rays, commonly referred to as a skeletal survey, is the current standard of screening for myeloma bone disease at diagnosis and consists of X-rays of the cervical, thoracic and lumbar spine, ribs, skull, pelvis and the proximal bones of the arms and legs.

X-ray imaging is universally available and enables large sections of the skeleton to be imaged at one time. It may also identify bones that are at risk of imminent fracture.

While useful for identifying bones at risk of imminent fracture, X-ray imaging is not particularly sensitive and requires at least a 30% loss of the bone before lytic lesions are detected by X-ray [10].

In cases where X-ray results do not reveal any evidence of skeletal damage but the patient reports bone pain, then other imaging techniques should be requested for further investigation. These include:

CT scanning

CT scanning is more sensitive and can detect myeloma-related bone involvement not seen with X-ray imaging. However, the benefit of CT scanning for myeloma patients remains under investigation and CT scans are not required for most patients.

Situations where CT scanning may be useful include cases where bone pain has been reported but there was no evidence of bone damage by X-ray imaging. It may also be useful for investigating areas that cannot be easily X-rayed e.g. sternum, certain rib areas, scapula and to plan radiotherapy and/or surgical interventions for myeloma bone disease.

MRI scanning

MRI scanning, like CT scanning, is more sensitive and produces more detailed images of bone than X-rays.

This is due to the superior soft tissue contrast resolution of MRI making it particularly useful for determining the extent of vertebral body involvement, evaluating vertebral tumour masses and confirming suspected spinal cord compression.

Whether an MRI or CT scan is used depends on the clinical situation at hand and a joint decision will generally be made by the multidisciplinary team (MDT).

Bone assessment should therefore enable impending fractures to be identified and intervention considered, as well as confirming existing fractures for which prompt treatment is needed.

Pain

Bone pain is the most frequent symptom of myeloma bone disease.

The type and intensity of the pain varies according to the location, nature and extent of bone damage. Therefore a pain assessment asking the following questions should be made so that it can be managed accordingly:

- Onset – when did the pain start and was trauma involved?
- Location – where is the pain located?
- Quality – is the pain dull, sharp, burning or stabbing?
- Duration – how long has the pain been apparent?
- Character – is the pain present when sitting, moving, all of the time or some of the time?

Since each patient's perspective of pain is different, patients should also be asked to rate their pain according to a pain scale e.g. where 1 represents minimal pain and 10 represents extreme pain.

Spinal cord compression

Of the various skeletal complications, early detection and assessment of vertebral compression fractures with the risk of, or resulting in, spinal cord compression is the most important.

Any of the following neurological symptoms should be considered as a medical emergency and immediate medical care is necessary to decompress the spinal cord and prevent permanent nerve damage:

- Severe back pain
- Radiculopathy – causing numbness, tingling, shooting pains
- Any limb weakness or difficulty in walking
- Loss of sensation
- Loss of bladder or bowel control

Although back pain is a common symptom in myeloma, particular attention should be paid to the following as these are characteristic of spinal cord compression:

- Pain in the thoracic or cervical spinal regions
- Progressive pain in the lumbar region
- Severe unremitting lower spinal pain
- Spinal pain aggravated by straining (e.g. when opening bowel) or when coughing or sneezing
- Localised spinal tenderness
- Pain when lying down

Table 1: The Frankel grading system for spinal cord compression

Grade	Status	Sensory function below level of compression	Motor function below level of compression
A	Paraplegia	No sensation	Complete paralysis (no function)
B	Sensory function only	Some sensation	Complete paralysis (no function)
C	Non-ambulatory	–	Some motor function but of no practical use to the patient
D	Ambulatory	–	Some motor function with some use to the patient
E	No neurologic signs or symptoms	Normal	Normal

Confirmation of spinal cord compression is carried out by whole body MRI scanning as described earlier, together with functional assessment using the Frankel grading system [11] (Table 1). However, nurses would not be expected to carry out this assessment.

Spinal cord compression is progressive and in the event of suspected spinal cord compression of any grade (as above) patients should be treated as an oncological emergency.

Treatment

Treatment of myeloma bone disease is of paramount importance to limit the risk of further complications and to improve patients' quality of life.

This involves the treatment of the myeloma itself together with appropriate supportive treatments.

The latter is a matter of priority for patients with established myeloma bone disease, hypercalcaemia, impending or actual fractures, or spinal cord compression and is often started before anti-myeloma treatment is initiated.

The different types of anti-myeloma treatment are not covered in this guideline, but the most common types of supportive treatment for myeloma bone disease are described below.

Analgesia

Pain is the most common and debilitating symptom of myeloma bone disease and where necessary analgesia should be administered to relieve pain, increase mobility and improve quality of life. Effective pain management is crucial because the psychosocial aspects of pain can, in some cases, lead to depression and anxiety.

The main types of analgesia used to treat bone pain are either non-opioid analgesics such as paracetamol or stronger opioid analgesics such as codeine, morphine and morphine-like synthetic compounds. Non-steroidal anti-inflammatory drugs are not recommended because of the risk of renal impairment.

Side-effects, particularly the opioids, can include nausea, loss of appetite, constipation and sedation.

The type of analgesia prescribed will be considered on a case by case basis depending on the effectiveness of and tolerance to the drug.

Neuropathic pain caused by spinal cord compression may require other types of drugs such as gabapentin, pregabalin or tricyclic antidepressants such as amitriptyline.

Bisphosphonates

Bisphosphonate drugs are the standard anti-osteolytic treatment for myeloma bone disease. They work by inhibiting osteoclast activity and bone resorption, so reduce or prevent further bone deterioration but they do not repair existing bone damage. In addition, they are used to alleviate the symptoms and complications of myeloma bone disease, particularly hypercalcaemia and bone pain.

It is recommended that all patients with symptomatic myeloma receive bisphosphonate treatment whether or not they have evidence of myeloma bone disease [9].

Currently, three bisphosphonates are approved for the treatment of myeloma bone disease (see Table 2). The choice of treatment depends on individual clinical factors, local practice and patient and doctor preferences.

Evidence from the Myeloma IX study indicates that zoledronic acid (previously known as Zometa®) is superior to sodium clodronate (Bonefos®), not only in reducing the number of skeletal-related events but also in offering a survival advantage [12].

Zoledronic acid is therefore becoming the treatment of choice for myeloma patients but a consensus has yet to be reached on the optimum duration of treatment.

At present, the duration of bisphosphonate treatment is guided by individual factors such as remission status, extent of myeloma bone disease and patient preference. In most cases, bisphosphonate treatment is recommended for at least two years [13]. If a patient has stopped bisphosphonate treatment, it should be restarted at the time of relapse.

Intravenous bisphosphonates are also important in the treatment of moderate to severe hypercalcaemia (corrected calcium 2.9mmol/L) and should be given in conjunction with intravenous saline rehydration. Adequate urinary output should be ensured and in some cases, furosemide or other intravenous loop diuretics should be considered to prevent volume overload and promote urinary calcium excretion. A further dose of bisphosphonates may be given after 72 hours if the calcium remains high.

Thirdly, bisphosphonates are effective in reducing bone pain and maintaining it at a lower level [12] and are often used together with other pain management strategies. Their use helps to improve quality of life and reduce the need for analgesia.

Bisphosphonates are generally well tolerated; however they are associated with a number of different side-effects depending on the type of bisphosphonate.

The more common potential side-effects of oral bisphosphonates include:

- Diarrhoea
- Nausea
- Vomiting
- Abdominal pain – oral bisphosphonates should be taken with water (not milk) at least one hour before or one hour after food. Administration twice daily instead of once daily may improve gastrointestinal side-effects

Potential side-effects of intravenous bisphosphonates include:

- Inflammation at the injection site causing pain and swelling
- Flu-like symptoms such as fever, muscle/bone/joint pain – managed with paracetamol but should resolve within three days
- Hypocalcaemia – managed with oral calcium and vitamin D
- Renal insufficiency – creatinine should be monitored prior to each infusion of bisphosphonates so that any renal problems can be detected. In cases where renal dysfunction is apparent, doses and/or infusion rates should be reduced. Bisphosphonate treatment should not be given if creatinine levels are more than 10% above normal
- Osteonecrosis of the jaw (ONJ) – whilst a rare complication, ONJ can potentially be very serious and is best managed through exercising good oral care

In most cases, a modified dosing schedule or preventative measures can greatly reduce the incidence and/or severity of the side-effects of bisphosphonate.

Table 2: Bisphosphonates commonly used in the UK

Generic name	Trade name	Method and frequency of administration
Sodium clodronate	Bonefos® Loron®	Orally, taken once or twice per day
Disodium pamidronate	Aredia®	Intravenous infusion over 90 – 120 minutes, monthly
Zoledronic acid	Zometa®	Intravenous infusion over 15 minutes, monthly

Radiotherapy

Radiotherapy may be used both as an anti-myeloma treatment and as a supportive treatment for painful or structurally damaging lytic lesions.

Radiotherapy is the treatment of choice for spinal cord compression and should be commenced as soon as possible, ideally within 24 hours of diagnosis.

It may also be used following stabilisation of long bone fractures and for pain control of localised myeloma bone disease.

Pain relief is usually obtained with doses of 3000cGy in 10 – 15 fractions. Patients with generalised widespread bone pain due to involvement of multiple sites may receive hemi-body irradiation to doses of 600cGy to the upper body and 800cGy to the lower body. However, as radiotherapy can reduce bone strength, cases should be considered on an individual basis.

When used in the management of pain, radiotherapy can sometimes increase pain initially and it can take a few weeks for patients to feel the full benefit of radiotherapy treatment.

It is important to note that radiotherapy can cause the following side-effects depending on the site being treated:

- Fatigue
- Loss of appetite
- Mucositis and dry mouth
- Diarrhoea
- Bone marrow suppression
- Skin reactions
- Cystitis
- Hair loss

In addition, it is important to be aware that radiotherapy should not be given to patients already undergoing systemic treatment.

High-dose steroids

High-dose steroids may be used in the treatment of spinal cord compression. Treatment should begin immediately after diagnosis, the aim of which is to reduce inflammation and provide pain-relief.

Steroid treatment should be reduced as soon as possible or when the patient is stable to prevent long-term toxicities.

However, not all patients will be able to stop steroids and a maintenance dose may be required to preserve neurological function [14].

Surgical interventions including Percutaneous Vertebroplasty and Balloon Kyphoplasty

Surgical interventions may be required to treat fractures or to stabilise areas of bones prior to radiotherapy or those that are in danger of fracturing. In many cases, an orthopaedic opinion should be sought to determine whether prophylactic surgical intervention is required.

Procedures of this nature may include intramedullary rod placement or pins and screws may be used to surgically fix the bone. Open surgical repairs, while invasive, may also be considered.

Two additional procedures, Percutaneous Vertebroplasty and Balloon Kyphoplasty, are also available specifically to treat vertebral compression fractures. Both involve minimally invasive procedures to repair and stabilise the fractured vertebra by injection of bone cement under contrast guided imaging with CT or CT fluoroscopy with the aim of improving mobility and relieving pain. Balloon Kyphoplasty also aims to restore vertebral height.

In general, the procedures are limited to patients who are refractory to more conservative treatments and the decision to treat a patient with Percutaneous Vertebroplasty or Balloon Kyphoplasty should be made jointly by the multidisciplinary team.

Nursing interventions and management

Nurses play a central role, both medical and non-medical, in the overall management of myeloma bone disease and in promoting adequate bone health throughout the course of a patient's myeloma.

The following provides best practice recommendations for nursing interventions related to the assessment, treatment and monitoring of patients with myeloma bone disease and nursing management involving a more holistic approach to care.

Interventions

- Perform a baseline assessment of pain associated with myeloma bone disease and inform the multidisciplinary team of any problems reported by patients
- Offer adequate analgesia or sedation to patients who have skeletal complications which may make imaging and scanning procedures uncomfortable or painful; ensure that the patient is wearing loose clothing to gain access to the area being scanned. If a hospital gown is being worn, the patient may need a dressing gown and slippers for privacy and warmth
- If imaging investigation involves contrast medium, determine if patient has allergies or renal insufficiency and report to radiography staff
- Assess the day-to-day independence of patients and their ability to perform activities of daily living safely such as bathing, getting in and out of bed, going to the toilet etc, so that falls and fractures are avoided. Coordinate referrals to physiotherapy and occupational therapy teams where appropriate or to other members of the multidisciplinary teams if necessary
- Ensure patients with suspected spinal cord compression are nursed flat with neutral spine alignment including "log-rolling" or turning beds and use a slipper pan for toileting until bony and neurological problems have been stabilised
- Check to see if a female patient of child-bearing age is or could be pregnant before they undergo X-ray investigations
- If a patient is at risk of a spontaneous fracture ensure that they are not turned or moved in such a way that may contribute to a fracture
- Prophylactic treatment of impending fractures and treatment of pathological fractures may involve bracing or supporting the affected region. Make sure these are properly positioned and checked regularly so the patient is as comfortable as possible
- Coordinate referrals to maxillofacial/dental teams if required and provide liaison between the maxillofacial/dental and haematology teams
- Continue to assess patients for pain and ensure effective pain-relief and intervention is provided where required
- In the case of spinal cord compression, assess the pressure areas as a baseline and ensure that the patient is given an appropriate mattress. Referral to tissue viability or rehabilitation may be required for some patients

Management

- Discuss with patients the different investigations for myeloma bone disease and the supportive treatment options
- Inform and educate patients and their families about the signs and symptoms of myeloma bone disease and associated complications such as hypercalcaemia and ensure that they know how, when and to whom the symptoms should be reported
- Provide patients with written information to help with their understanding of myeloma bone disease
- Advise patients and their families to maintain a safe home environment to minimise the possibilities of falls or other accidents. Coordinate with social care workers and occupational therapists if assistive devices are needed

- Reassure patients who are anxious about exposure to radiation when undergoing X-ray, CT scanning or radiotherapy. Provide them with information and explain that the benefits of the procedure far outweigh the very small risks involved
- Take regular height measurements to monitor patients for loss of height and/or the development of kyphosis
- Inform patients of the importance of adhering to oral bisphosphonate treatment and consider the factors which influence compliance when bisphosphonates are prescribed
- Educate patients on the possible side-effects of bisphosphonates. Ensure they are aware of osteonecrosis of the jaw and discuss the importance of self-care: maintaining good dental hygiene and avoiding dental extractions where possible; and maintaining a good daily fluid intake. For patients taking zoledronic acid, oral calcium (500mg/day) and vitamin D (400IU/day) supplements may be taken to prevent hypocalcaemia
- Discuss with patients the different types of analgesics and speak to them regularly about areas of existing and new pain. Teach patients how to describe pain and to rate it using a pain scale and if necessary coordinate referral to the pain team
- Advise patients to take their analgesics on a regular basis, as prescribed. For slow-release analgesics ensure that a breakthrough pain relief medication is also prescribed
- Ensure that patients taking opiate analgesics are also prescribed antiemetics and laxatives
- Explore with patients non-pharmacologic pain interventions such as relaxation techniques, transcutaneous electrical nerve stimulation (TENS), acupuncture/acupressure and the application of hot and cold compression packs
- Provide practical advice to patients after radiotherapy treatment to reduce the risk of potential side-effects such as:
    - Washing the treated area gently with warm water and patting dry with a soft towel
    - Avoiding creams, moisturisers, make-up, deodorants, perfumed soap or talcum powder on the treated area
    - Avoiding electric shavers or aftershave (for men) if having treatment to the head or neck
    - Keeping out of direct sunlight and using high-protection sunscreen and keeping away from direct heat such as sun lamps and hairdryers
- Make regular quality of life assessments, particularly with regard to how patients are coping with their day-to-day activities
- Encourage patients to maintain physical function. Give clear guidance regarding physical activity and exercise to maintain muscle strength, prevent thromboembolic events and improve quality of life. Coordinate referral to a physiotherapist if necessary and advise patients to speak to their doctor, nurse or physiotherapist before starting any new form of exercise or sport
- Educate patients and their families about signs and symptoms of depression and anxiety and coordinate referral to a counsellor or clinical psychologist if necessary
- Liaise with and inform community nurses looking after patients in care homes about myeloma bone disease and educate them to:
    - Look out for symptoms and complications of myeloma bone disease
    - Report any observed symptoms back to the hospital
    - Take immediate action to transfer patients with symptoms that require urgent referral back to hospital
- Promote interdisciplinary communication between colleagues to ensure successful management of each patient
- Stay current with new developments in myeloma bone disease
- Help with or make appropriate referrals for benefits advice

Summary

Myeloma bone disease is a central feature affecting the vast majority of myeloma patients. The consequences of myeloma bone disease such as bone pain, hypercalcaemia and skeletal-related complications can greatly reduce quality of life.

Therefore, supportive care and management of myeloma bone disease is an absolute priority. Nurses play a crucial role in optimising patient outcome through effective nursing intervention and management.

Abbreviations

- cGY CentiGray
- CT Computerised Tomography
- IU International units
- mg milligrams
- MRI Magnetic Resonance Imaging
- TENS Transcutaneous electrical nerve stimulation

About the Nursing Best Practice Guides

The Nursing Best Practice Guides for the Management of Myeloma have been developed by Myeloma UK and an expert nursing advisory group including; Marvelle Brown, Shirley Crofts, Flora Dangwa, Sophie Deppe, Jeff Horn, Mary Kelly, Tracy King, Monica Morris, Moira Stephens, Sharon West and Maggie Lai, Myeloma UK.

About Myeloma UK

Myeloma UK is the only organisation in the UK dealing exclusively with myeloma, a bone marrow cancer for which there is no cure, but many very effective treatments.

Our broad and innovative range of services cover every aspect of myeloma from providing information and support, to improving standards of treatment and care through research and campaigning.

For more information about Myeloma UK and what we do, please visit www.myeloma.org.uk or contact us at myelomauk@myeloma.org.uk or +44 (0)131 557 3332.

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