

The diagnosis and management of a pathological fracture: a case report

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ABSTRACT

A 64 year old female patient presented to the Accident and Emergency (A&E) department at the Royal Lancaster Infirmary (RLI) with a significant left sided jaw pain. This patient reported paraesthesia and a shooting pain radiating down her left mandible. There was also marked trismus on examination. Her medical history included a history of a previously diagnosed Squamous Cell Carcinoma (SCC) of the left soft palate. This was staged at T2N0M0 and treated with radiotherapy and chemotherapy. Following a clinical examination, special investigations via imaging were obtained prior to a formal diagnosis of pathological fracture of the left mandible following previous radiotherapy for her SCC treatment.

This case report will discuss the incidence, background, management and treatment of osteoradionecrosis (grade 3) (ORN) of the mandibular jaw bone as well as the associated pathological fractures and the detrimental effects following the use of radiotherapy to the head and neck region.

INTRODUCTION

Radiotherapy to the head and neck region can have a significant effect on a patient's overall wellbeing. This includes both immediate and long term effects on a patients' overall oral environment. Long term effects include the risk of osteoradionecrosis (ORN) of the jaw bone which may predispose to a pathological fracture. ORN is the necrotic and exposed bone associated with an ulcerated or necrotic surrounding soft tissue, persisting for more than three months in an area previously exposed to radiation.¹ A systematic review carried out reviewing a total of 5742 patients undergoing radiotherapy to the head and neck, reported approximately 2% of this cohort exhibiting signs and symptoms of ORN.²

The ORN three-stage classification has been developed by Notani et al,³ to outline the various treatment modalities for each diagnosis. Prevention is a key component in the holistic approach to managing patients undergoing radiotherapy and is a fundamental aspect of overall patient care and management. This article will review a case managed within the Oral and Maxillofacial (OMFS) department at the RLI regarding a patient presenting four years post radiotherapy for a SCC of the soft palate with a left sided body of the mandible pathological fracture.

HISTORY

A 64 year old female patient underwent chemotherapy and radiotherapy at the Royal Preston Hospital for a previously diagnosed SCC of the soft palate. Following this treatment, the patient had been under long term follow-up and review within the OMFS department. This patient presented with a history of a left sided facial pain, with an element of recently onset paraesthesia associated with the mandibular branch (V3) of the trigeminal nerve. The patient reported increasingly deteriorating trismus, with difficulty eating as well as intermittent episodes of trigger point pain radiating down the mandible, from the temporal and pre-auricular region.

On clinical examination, there were no significant extra-oral features of immediate concern. The facial nerve (CN7) was deemed intact. No facial asymmetry or lymphadenopathy was noted. On intra-oral examination, the lower left wisdom tooth was tender on palpation, no dental pathology was noted. No obvious sublingual haematoma was present. A slight step deformity was present at the area of the left angle of the mandible, but with no significant mobility evident.

The patient's medical history includes a well-controlled medical diagnosis of Crohn's disease as well as a previous diagnosis of temporal cell arteritis.

Special investigations were obtained. This included an Orthopanthogram (OPG) (figure 1), Computerised Tomography (CT) of the mandible (figures 2 and 3).



Figure 1: Orthopanthogram (OPG) obtained pre-operatively.



Figure 2: Axial plane of Computerised Tomography (CT) with report discussing pathological displaced fracture of the left mandible.



Figure 3: Coronal plane of Computerised Tomography (CT) with report discussing pathological displaced fracture of the left mandible.

DIFFERENTIAL DIAGNOSIS

Osteoradionecrosis (ORN)

As previously discussed, this diagnosis occurs in the region of the maxilla or mandible following irradiation. This phenomenon has been classified in a variety of ways. This report will discuss the classification by Notani et al.³ This is whereby Grade 1 is the non-healing area confined to the localised alveolar bone. Grade 2 describes the ORN affecting the local alveolar bone and the mandible above the inferior alveolar canal. The final grade involves the area of bone below the level of the inferior alveolar nerve, formation of a fistula or a pathological fracture of the bone.

There are a variety of theories for the ORN phenomenon, the most recent being the “fibro-atrophic theory”.⁴ This is based on the idea that osteoclasts in the bone undergo radiation damage at a greater rate than the local vascular alterations. The progression of ORN is through the activation and irregular fibroblastic activity which concludes atrophic tissue within an irradiated area. Following radiotherapy the endothelial cells within the bone incur injury from both direct radiation damage and from indirect radiation-generated oxygen free radicals. These injured cells produce inflammatory markers in the form of cytokines which initiate an acute inflammatory reaction attracting an immune response to the area, in the form of phagocytosis.⁴ The endothelial cell destruction, alongside the thrombosis of the local vascular structures, leads to necrosis giving rise to the theory of ORN.⁴

Osteomyelitis

An osteolytic and destructive process occurs due to “inflammation of the bone marrow”. The appearance of this diagnosis is recognised by a ‘moth-eaten’ appearance on a plain film radiograph. Osteomyelitis may occur as a side

effect of radiotherapy treatment. Poor bony quality may lead to a pathological fracture.¹

Temporal arteritis (also known as giant cell arteritis)

This systemic autoimmune disorder is characterised through inflammation of the temporal artery. This is a diagnosis commonly affecting females over the age of 50. Symptoms of temporal arteritis include a pulsatile headache in the temporal region in conjunction with jaw claudication and myofascial pain. Histopathology results show granulomatous inflammatory lesions, often associated with Langhans type giant cells.⁵

Temporomandibular joint disorder (TMJPDs)

Temporomandibular joint disorder is a complex multifactorial aetiology leading to increased muscular pain and tension. Through muscle over-exertion the release of lactic acid occurs. On clinical examination, features of TMJPDs include a reduced or dysfunctional mandibular range of motion, malocclusion, and joint or preauricular tenderness. Often a patient will complain of concurrent headaches or earaches. TMJPD treatment is often initially approached conservatively with techniques described to reduce the over-exertion of the muscles of mastication. Patients may in addition be advised to control the muscular pain with anti-inflammatory medications such as NSAIDs.⁶

Neuralgia pain/trigeminal neuralgia

Trigeminal neuralgia (TN) is a disorder of the trigeminal nerve that consists of episodes of unilateral intense, stabbing and electric shock-like pain in the areas of the face innervated by each branch of the cranial nerve. TN is not fatal; however it is recognised to be intense and when uncontrolled often debilitating for patients. TN may also lead to sensory loss of the regions affected; therefore it is important to exclude malignant disease as a cause.⁷

Recurrent oral squamous cell carcinoma (SCC)

Oral squamous cell carcinoma (OSCC) constitutes the predominant neoplasm of the head and neck region and constitutes 95% of all cancers of this area. Men over the age of 50 years old are affected twice as commonly as women. The prognosis is poor and the five-year survival rate ranges from 20% (OSCC in the floor of the mouth) to 60% (OSCC in the alveolar part of the mandible). Treatment is difficult, because of the localisation and the invasiveness of the available methods. The diagnosis is made based on a histopathological examination of a biopsy sample.

MANAGEMENT

As per the Notani et al³ classification for pathological fractures the treatment suggested usually involves resection with composite free flap. Further treatment options were discussed in depth with the patient. These included:

- Leave and monitor the site, with the likelihood of deterioration and worsening symptoms
- General anaesthetic (GA) open reduction internal fixation (ORIF) of the left mandibular region.

A decision and consent for the surgical extra-oral approach of an ORIF was adopted under a GA (figures 4 and 5).

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Figure 4: An external approach to identify the mandibular left ramus and expose the site of pathological fracture.



Figure 5: Fixation via ten-screw plate to optimise stability.

SURGERY

Indications: Displaced pathological fracture of left angle of mandible, compressing ID nerve causing severe pain.

Name of procedure: Open reduction and internal fixation of left fracture, external approach.

The extra oral approach is required for the mandibular body/angle.⁸ To gain access to the angle of the mandible an incision should be made two finger breadths below the lower mandibular border. The skin and sub-cutaneous tissue are incised; this is then followed by the dissection of the platysma which takes place perpendicular to the muscle fibres.

To protect the cervical branch of the facial nerve the incision should be carried out through the deeper cervical fascia. In this case the facial vein and artery had to be ligated.

After exposure of the site using the extra-oral approach the overlying periosteum is incised and reflected, exposing bone and the fracture site. Once direct vision was obtained there was a clear difference in quality of the bone when comparing the fracture site to the anterior/posterior segments, this can be appreciated by looking at figure 5.

The critical step is to ensure that we have correctly aligned the two bony fragments and that the occlusion is re-checked before screws inserted. The mandible was then plated with 10x10mm locking screws in a recon bar spanning across the pathological fracture site, ensuring each end was placed on sound healthy bone.

In addition, by using the appropriate plate benders the plate can be adapted satisfactorily to the bone and in this case a template was used beforehand. The surgical site was then closed in layers with the deeper layers such as periosteum

and platysma being closed using a resorbable suture material and the final layer of skin being closed used a non-resorbable material.

DISCUSSION AND CONCLUSION

Ongoing pain and paraesthesia in the left hand side mandibular were the patient's main motivators for treatment. ORN can often be a debilitating diagnosis and the importance of prevention and prophylaxis, particularly when managing the oral cavity, should be reinforced to patients prior to commencing radiotherapy.⁹ The effects of the radiotherapy treatment on the jaw bone can be present for up to 231 months following initial exposure.¹⁰

At the current time, there is no formally accepted way to prevent the ORN phenomenon for patients undergoing radiotherapy to the head and neck. It is important to note that the prevalence of ORN resulting in fractures is relatively low, with approximately 4.3% in patients being treated with radiotherapy for oral cancers.¹¹

Following the surgical approach to treatment, this patient was followed up one-week post operatively. During this appointment, she reported a resolution in her pain and her occlusion has returned to a comfortable position.

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