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Clinical Oncology

journal homepage: www.clinicaloncologyonline.net

Overview

Current Concepts in Osteoradionecrosis after Head and Neck Radiotherapy

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Received 8 February 2016; received in revised form 1 March 2016; accepted 10 March 2016

Abstract

Osteoradionecrosis (ORN) of the jaws is a feared complication of head and neck radiotherapy. ORN causes significant morbidity for patients and controversy among clinicians. This overview considers the variations in definition and classification of the condition that affect estimates of incidence and also the interpretation of evidence. The influence of newer radiotherapy techniques in reducing ORN through reduced dose and xerostomia is balanced against a probable increase in a vulnerable population through a rising head and neck cancer incidence. Theories of pathophysiology of ORN include radiation-induced osteomyelitis, hypoxic and hypovascular theory and fibroatrophic theory. Prevention strategies include restorative dentistry and radiation planning techniques. Treatments range from conservative ‘watch and wait’ through to more radical surgical strategies. Newer medical management strategies are available with a limited evidence base. The use of hyperbaric oxygen therapy remains controversial and the background and need for newer hyperbaric oxygen trials is discussed.

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Key words: Classification; definition; osteoradionecrosis; pathophysiology; treatment

Statement of Search Strategies Used and Sources of Information

This overview reflects the opinion of the authors and evidence has been presented accordingly. It is based upon our own research findings and clinical trial experience. It is not a systematic review and therefore no formal search of the evidence base was undertaken; this was carried out in a recent Cochrane review (2012) and is cited in the paper.

Introduction

Osteoradionecrosis (ORN) of the jaws is a complication of radiotherapy used for the treatment of head and neck malignancy. From its first description, nearly 100 years ago, the

definition and classification of the condition have evolved, and likewise new theories of its pathophysiology have led to new approaches in the treatment of the condition [1]. The evidence for treatment, however, is based on a few randomised control trials; some have paucity of detail, whereas others lack rigor, and most have small cohorts [2]. When symptoms become serious enough to mandate surgical intervention it becomes a significant problem. It is feared among surgeons who have the unenviable task of operating on irradiated tissue in patients who suffer significant comorbidities.

Definition

There are numerous definitions of ORN and, likewise, many classification systems have been proposed [1,3]. What is common to all these definitions is the presence of devitalised or necrotic bone in an irradiated field, in the absence of neoplastic disease (Figure 1). How this devitalised bone is

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<http://dx.doi.org/10.1016/j.clon.2016.03.002>

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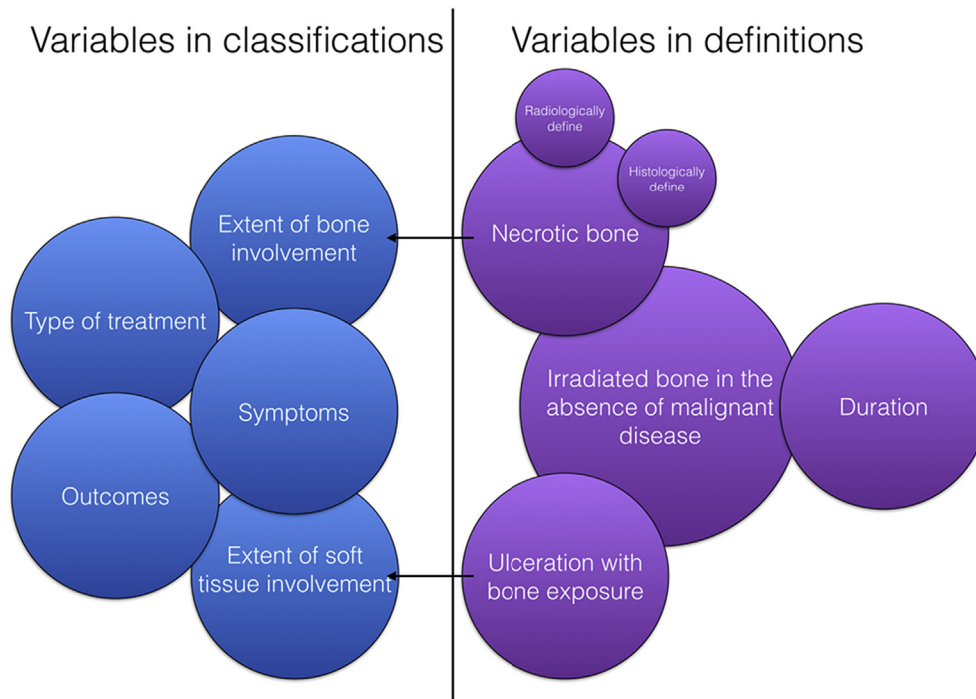


Fig 1. Common variables found in both the definition and classification of osteoradionecrosis.

diagnosed adds to the controversy in the definition. Does it require only clinical examination and a histological assessment of bone or, as some have suggested, does it also have to be based on radiological evidence [4,5]? Subtle differences in these definitions include the duration of the condition and the presence and extent of both bone and soft tissue involvement [6–8]. The duration can vary from 2 to 6 months with the minimum period allowing for healing after trauma or surgery in the absence of ORN [9]. Although dental extractions are the most common surgical trauma associated with ORN, it can occur in the absence of trauma [2]. Adopting a wait and watch policy of 6 months to fulfil diagnostic criteria is considered too long by some, as an opportunity for early intervention and control are missed [8]. Harris's definition [10] is one commonly used by surgeons in which 'irradiated bone becomes devitalised and exposed through the overlying skin or mucosa, persisting without healing for 3 months in the absence of tumour recurrence'. More recent iterations of the definition include the presence of symptoms, which influences the management of the condition; ORN can be a very painful and debilitating disease for some patients. Another downside of this simplified definition is that it does not distinguish between progressive and improving lesions, which also influence the management of the condition.

The extent of mucosal ulceration is usually undefined (Figure 2). Any discontinuity of mucosa would strictly represent ORN using existing definitions but whether this should be quantified, as with bone extent, remains contentious. Infrequently, ORN can present radiologically in the absence of any ulceration and this rare group of patients would be excluded from most classification systems. The

classification suggested by Store and Boysen [4] does include this particular phenomenon in their definition of stage I disease. Whether the significance of small ulceration with bony healing represents incomplete resolution or completely intact mucosa is a prerequisite for the end point of healed ORN will hopefully become clear after the completion of the current clinical trials.

Classification Systems

Controversy over the various definitions of ORN manifests in the various classifications that have been proposed.

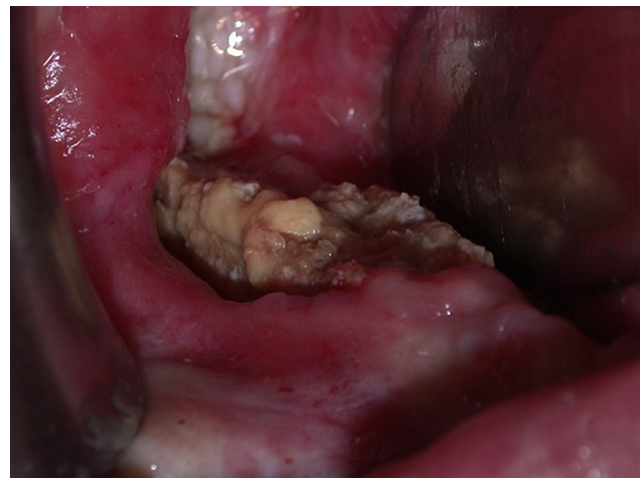


Fig 2. Clinical photograph showing osteoradionecrosis with significant mucosal ulceration and exposed necrotic bone.

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