

Osteoradionecrosis of the Jaws

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Introduction

- Terminology : Osteoradionecrosis (ORN) or Radiation Osteomyelitis
- Serious, late complication of therapeutic radiotherapy for head and neck cancers

Radiation effects


- Cancers of head and Neck



- Treated by RT, surgery, Chemo-RT, combination



- RT – Various side effects

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1. Mucositis
 2. Atrophic mucosa
 3. Xerostomia
 4. Radiation caries

Effects of Radiation

- Ionizing radiation destroy malignant neoplasm by damaging chromosomes
→ Cell division is impaired.
- Irradiation induces inflammatory changes in the soft tissues → Erythema, desquamation and pigmentation of overlying skin.
- Gradual devitalization of bone tissue → bone/soft tissue necrosis

Definition

Osteoradionecrosis (ORN) is an exposure of non-viable, non-healing, non-septic lesion in the irradiated bone, which fails to heal without intervention.

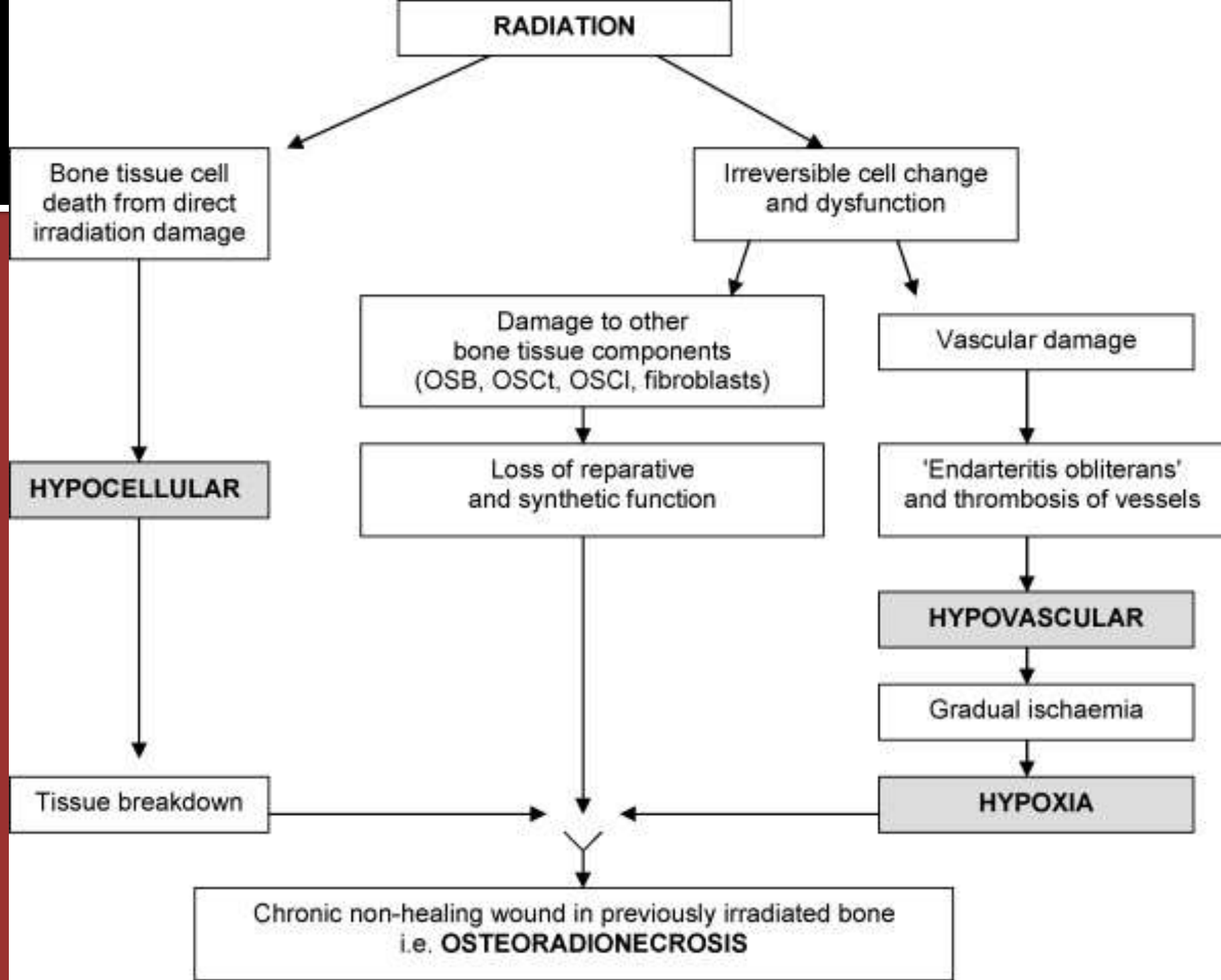
It is a sequelae of irradiation induced tissue injury in which hypocellularity, hypovascularity and hypoxia are the underlying causes.

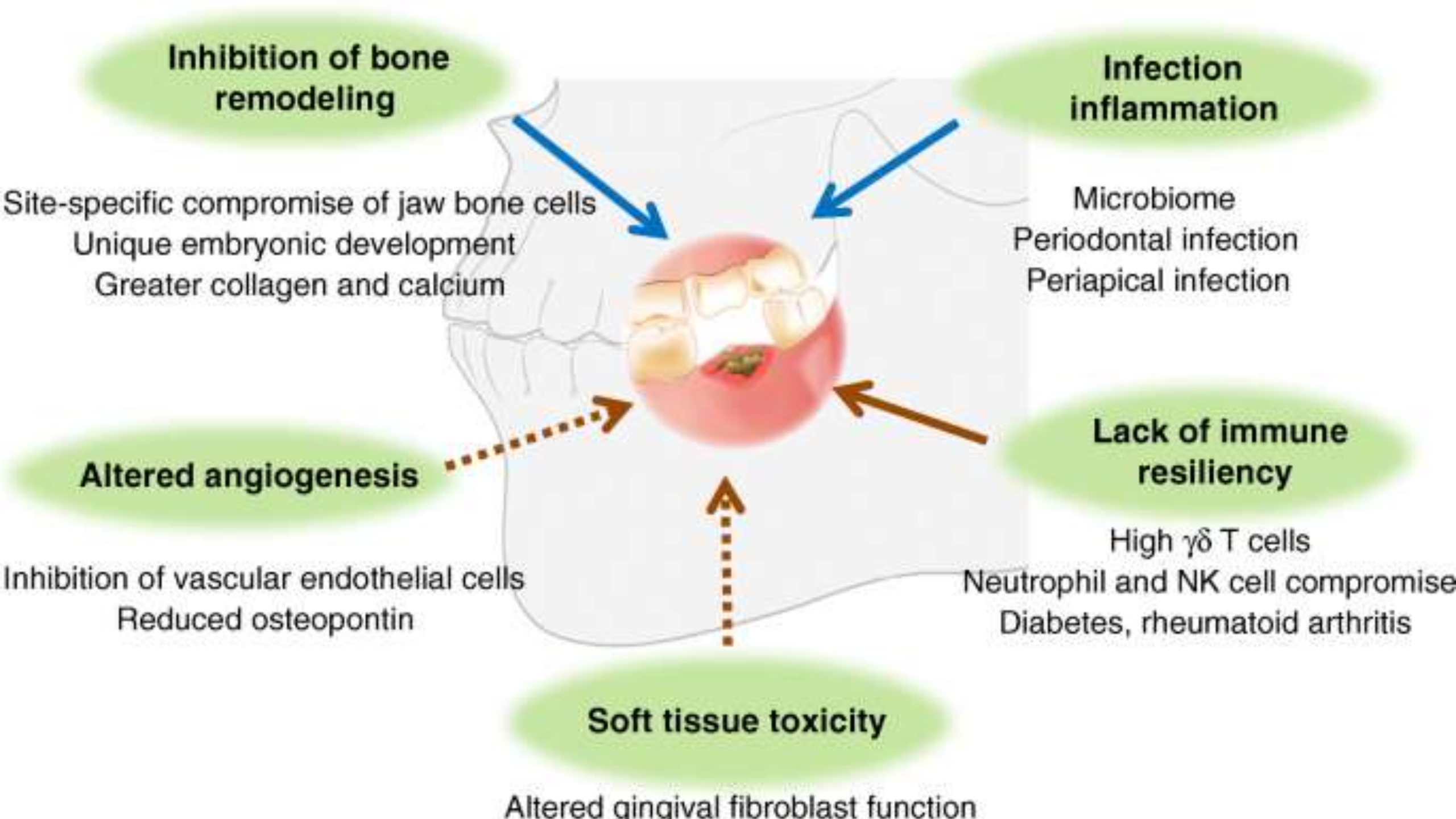
Etiology

- Radiation doses greater than 50 Gy cause irreversible damage
- Irradiated bone is hypercellular and hypervascular
- Dental extraction and denture trauma after radiation therapy

Etiopathology (Marx – 1983)

- Three 'H' principle of irradiated tissue. (Marx 1983)
 - Hypocellular
 - Hypovascular
 - Hypoxia
- Failure of Osteoclastic activity
- “Wound/ Injury whose metabolic and oxygen requirements for healing exceed the supply”

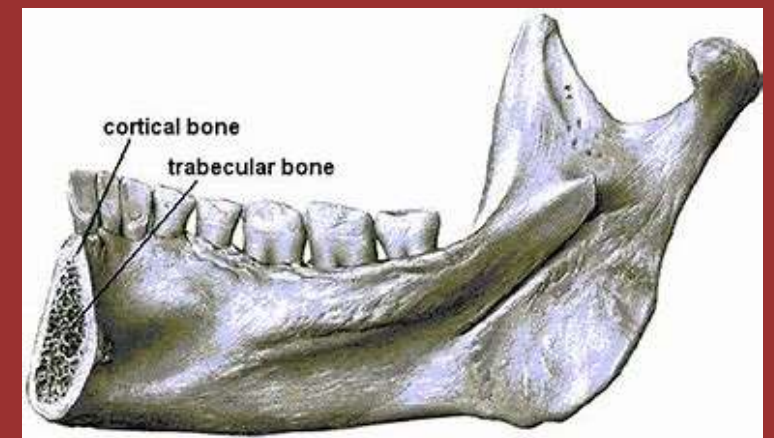
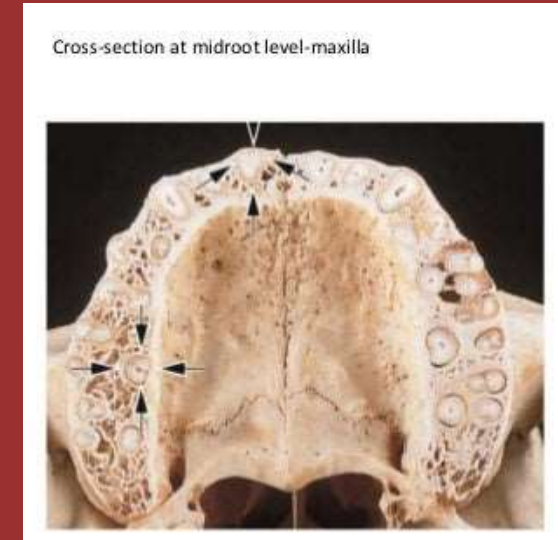




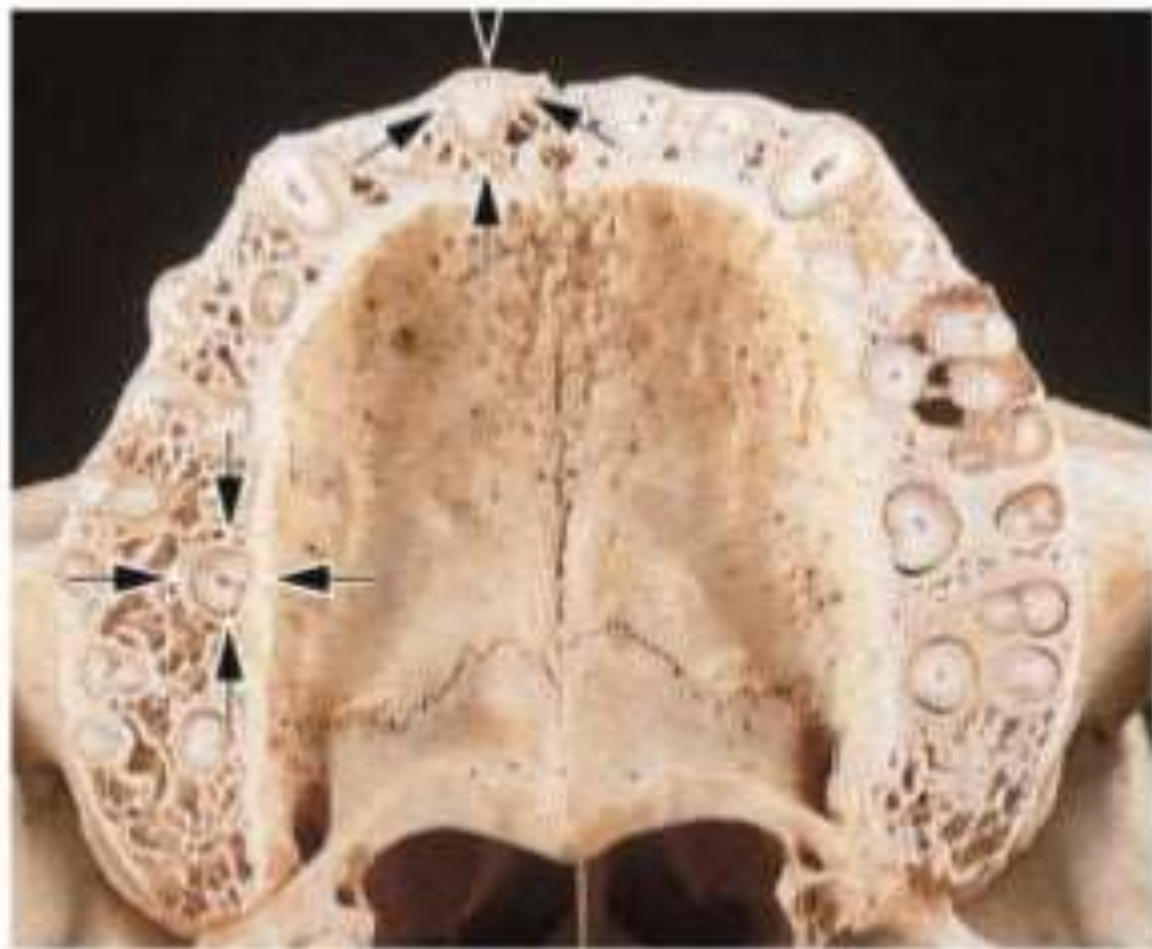
Clinical Features

1. Severe, deep , boring pain continuing for weeks or months
2. Swelling of face when infection develops
3. Soft tissue abscesses, persistently draining sinuses
4. Exposed bone associated with intra-oral or extra-oral fistula
5. Trismus
6. Fetid odour
7. Pyrexia
8. Pathological fracture

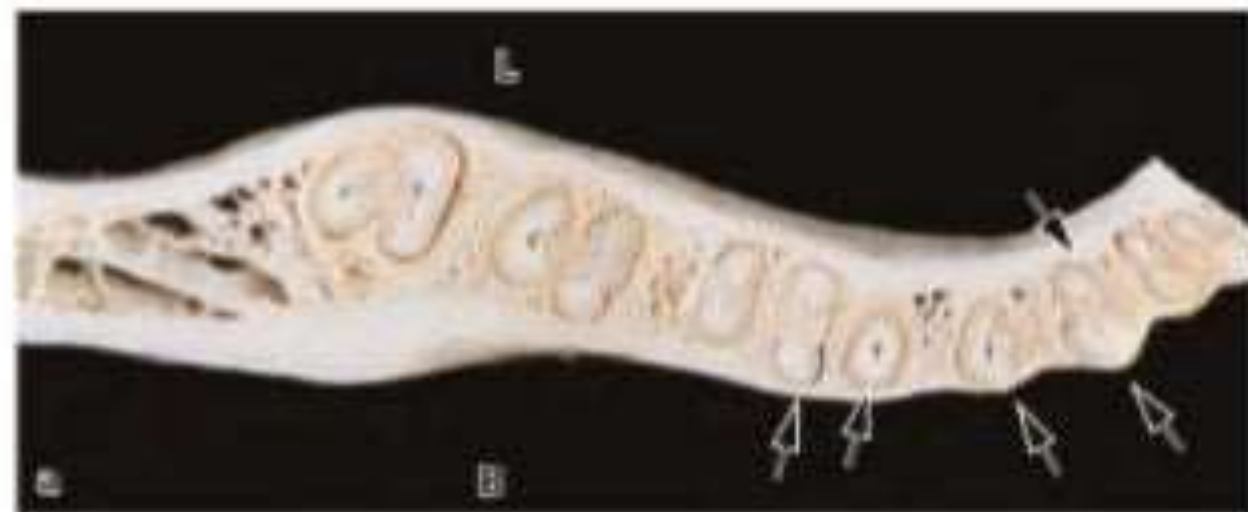
Mandible is more commonly affected than the maxilla due to micro-anatomy and vasculature.



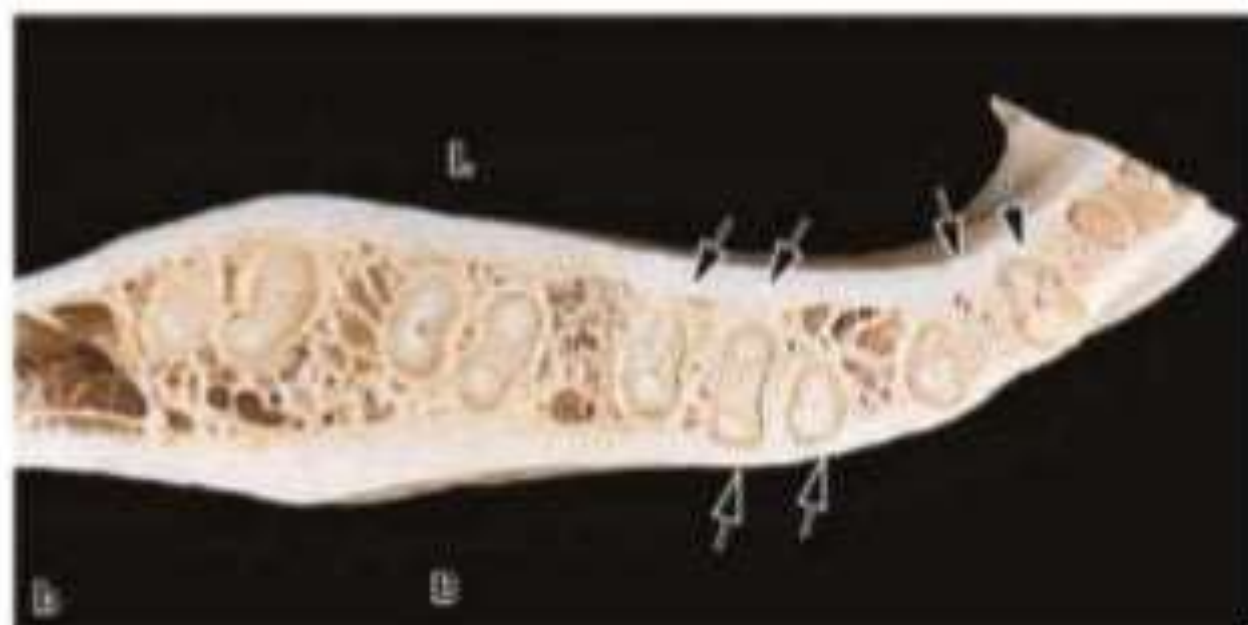
Cross-section at midroot level-maxilla



Cross-section at coronal third of root- Mandible



Cross-section at apical third of root- Mandible



Clinical features (Contd.)

- Based on cause:
 - Dental extraction: Area of denuded bone visible in the alveolar process
 - Slow sequestration occurs – Osteoblastic and osteoclastic activity is destroyed.
 - Sequestration : Large piece of bone is separated from unaffected vital part of mandible.







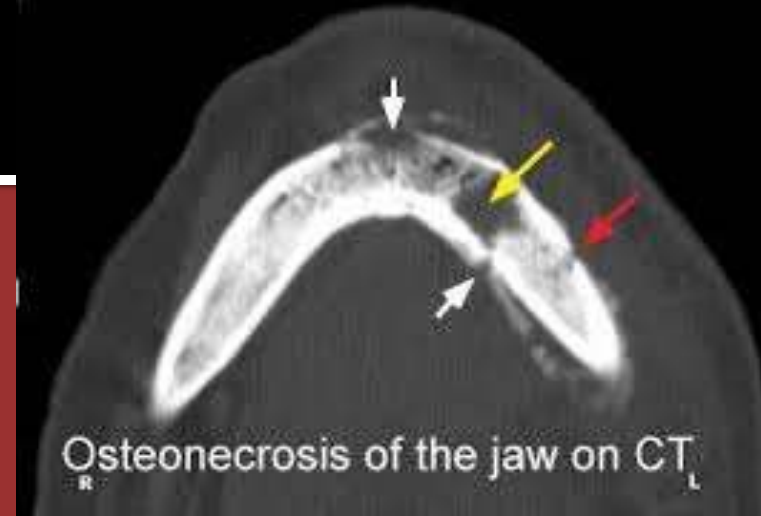
- Involvement of fascial spaces of head and neck leading to deep cellulitis.
- Sloughing on adjoining skin and mucosa
- Pathological fracture.

Radiographic features

- CT scan is the modality of choice
- Initial stages :
 - Well defined area of bone resorption within outer cortical plate of mandible.
- Late changes :
 - Lytic or sclerotic or mixture
- Advanced stages:
 - Radioluscent, indefinite non sclerotic borders, occasional areas of radiopacity associated with bony sequestrum

Radiographic features

- Periphery : Ill defined
- Internal structure : Range of bone formation and bone resorption occur.
Bone pattern is granular.
- Surrounding structures:
 - Stimulated periosteal bone formation is present
 - Widening of periodontal membrane space



EARLY



LATER



Management

- Conservative approach:
 - Administer antibiotics
 - Rinsing (Irrigation)
 - Sequestrectomy, local debridement
 - Use of narcotic analgesics, hydration , nutrition
 - Ultrasound therapy
- Radical method:
 - Hyperbaric Oxygen therapy
 - Local debridement , sequestrectomy
 - Mouth rinsing

Table 43.7: Recent development in treatment plan of ORN

1973	Greenwood and Gilchrist—First reported the benefits of HBO in postirradiated patients.
1975	Mainous and Hart—14 cases of refractory ORN of mandible treated with HBO and hemimandibulectomy.
1981	Mansfield— reported complete healing with HBO in 12 patients.
1993	Mckenzie— reported resolution of ORN following HBO in 69% of patients.

Table 43.8: Hudson, 2000: Treatment of radionecrotic wounds

1. Rule out recurrence of neoplastic disease.
2. Stabilize patient condition metabolically, especially nutritional status.
3. Administer preoperative hyperbaric oxygen treatment.
4. Debride soft and bony radionecrotic tissues as necessary.
5. Provide postoperative hyperbaric oxygen treatment.
6. Consider soft tissue vascular flap support.
7. Perform bony reconstruction as warranted.

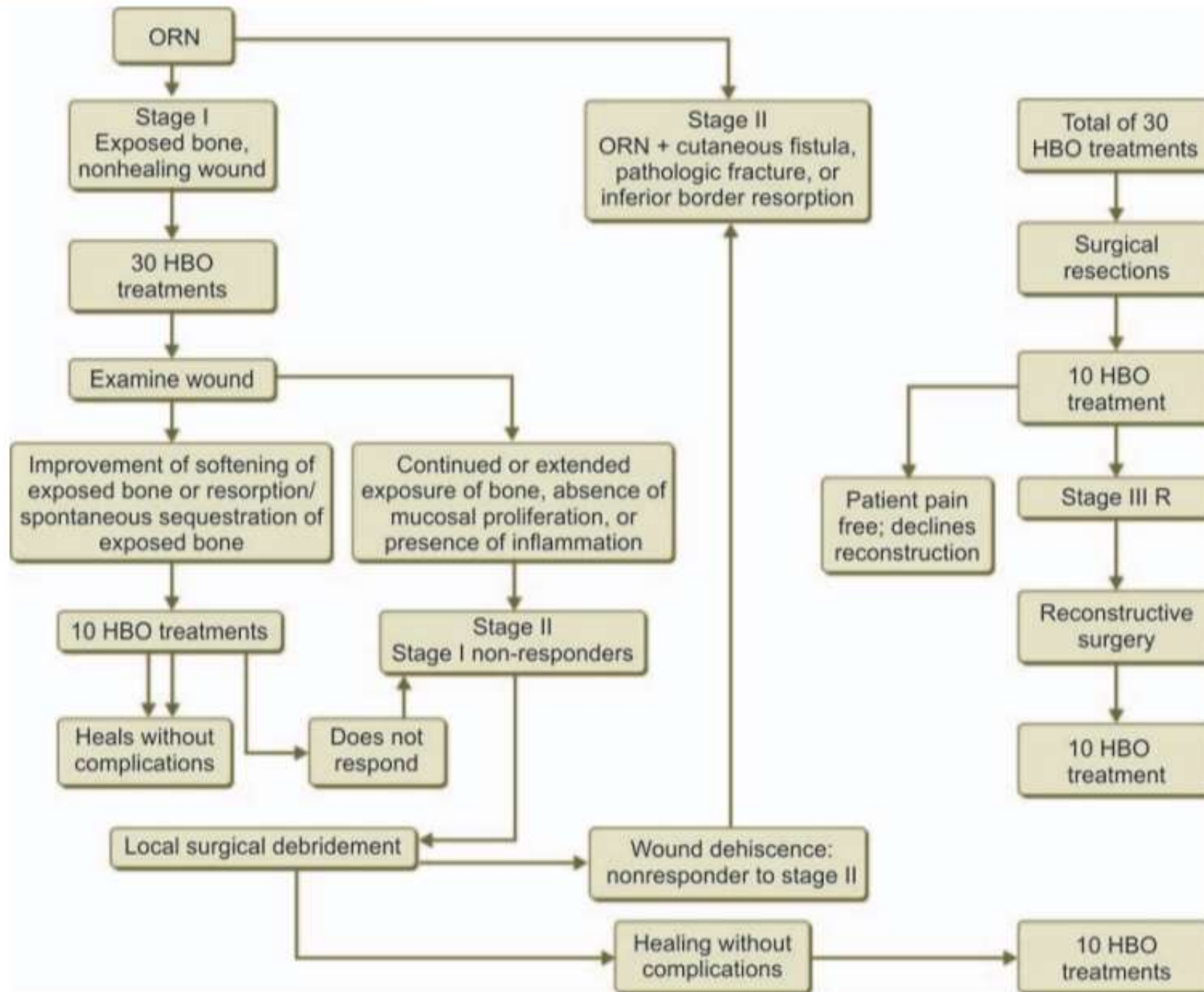
Hyperbaric O₂ Therapy

- Breathing 100% oxygen through facemask at 2.4 absolute atmospheric pressure for 90 minutes, 5times/week
- HBO therapy reduces the hypoxia, increases healing by increasing the arterial and venous oxygen tension

Treatment steps/options

1. Debridement
2. Control of infection
3. Other supportive treatment – fluids, High protein and vitamin diet
4. Frequent wound irrigation
5. Exposed dead bone pieces removed.
6. Small areas : treatment by drilling holes into vital bone (Hans and Corgill – 1967)
6. Sequestrectomy
7. Pathological fractures : Surgical removal of dead bone and graft placement
8. Bone resection
9. HBO therapy
10. HBO therapy in conjunction with surgery

Flowchart 43.1: Staging and treatment algorithm



Thank you!