Healing of Oral Wounds

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Healing

- Healing is the body response to restore normal structure & function

- It refers to replacement of damaged tissue by living tissue to restore function.

HEALING OF ORAL WOUNDS

Objectives of wound healing

- Epithelial regeneration
- Connective tissue repair

Factors affecting healing

- **Location of wound** *(vascularity, mobility)*
- **Physical factors** *(trauma, temp, radiation)*
- **Circulatory factors** *(anemia, dehydration)*
- **Nutritional factors** *(protein, vitamins, minerals)*
- **Age**
- **Infection**
- **Hormonal factors** *(corticosteroids, DM etc)*
- **Miscellaneous factors** *(suture materials, chemical tissue adhesives)*

Types of Healing

* Primary Intention

* Secondary Intention

BIOPSY

Definition:

Removal of tissue from living organisms for the purpose of microscopic examination

Indications:

- Lesion persists >2 weeks, no known etiology
- Inflammatory lesion not responding to t/t for 10-14 days
- Persistent hyperkeratotic changes in surface tissue
- Persistent tumescence
- Inflammatory changes of unknown cause &long duration
- Lesions that interfere with local function
- Bone lesions not identified clinically/ radiologically
- Lesion with characteristics of malignancy

Lesions that raise suspicion (of malignancy)

- Erythroplasia
- Ulceration
- Duration
- Growth Rate
- Bleeding
- Induration
- Fixation

Types of Biopsy

- Oral cytology
- Punch Biopsy
- Aspiration Biopsy
- Incisional Biopsy
- Excisional Biopsy

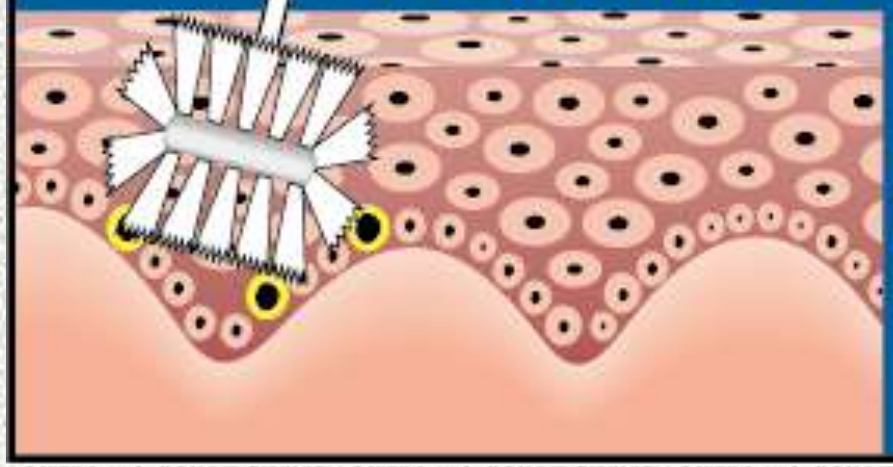
Exfoliative Cytology

- Adjunct to biopsy
- Quick, simple, painless, bloodless
- Check against false negatives
- Follow up of recurrent Ca / previously treated cases
- Screening lesions whose gross appearance does not warrant biopsy

BRUSH BIOPSY

Complete Transepithelial Tissue Sample

OralCDx Brush Biopsy Instrument

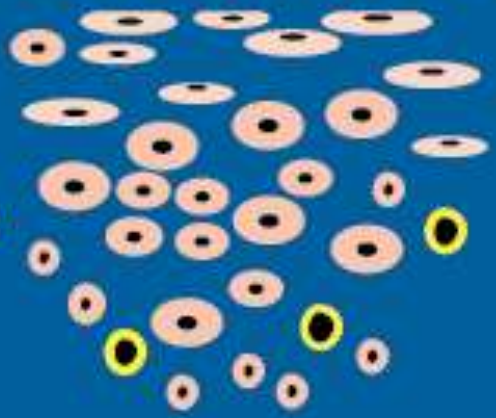


SPECIMEN

Superficial

Intermediate

Basal



Evaluation of cytologic smear

- Class I: normal
- Class II: atypical
- Class III: indeterminate, biopsy recommended
- Class IV: suggestive of cancer, biopsy mandatory
- Class V: +ve for cancer, biopsy mandatory

Indications

- Herpes, pemphigus, keratosis follicularis,
- HBID, white sponge nevus,
- Pernicious and Sickle cell anemia

Technique

- Stain : PAP stain

Punch Biopsy

Removal of a small sample of tissue with a biopsy punch

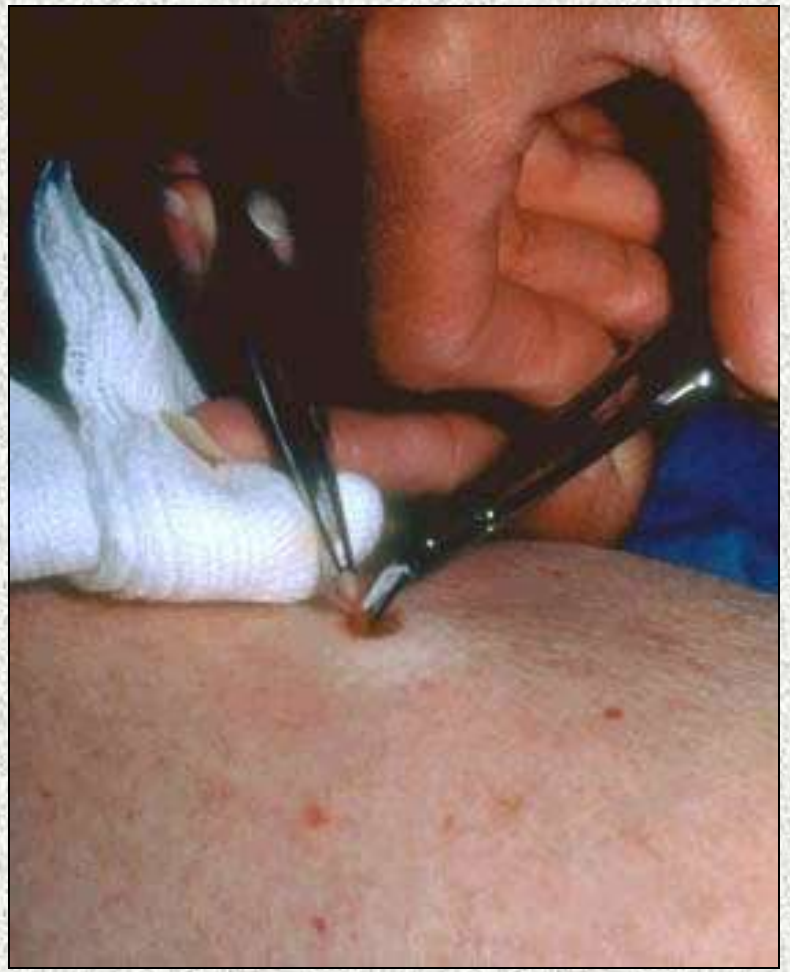
Indications

- Deep skin lesions
- Gastrointestinal lesions
- Oral and nasal lesions

Punch Biopsy contd.

- Difficult on freely movable oral tissue
- Appropriate only in the hard palate and other sites with better support and tissue that is bound down
- The wound heals by secondary intention
- Discomfort may persist longer than anticipated by the clinician and the patient.

Technique



Aspiration biopsy

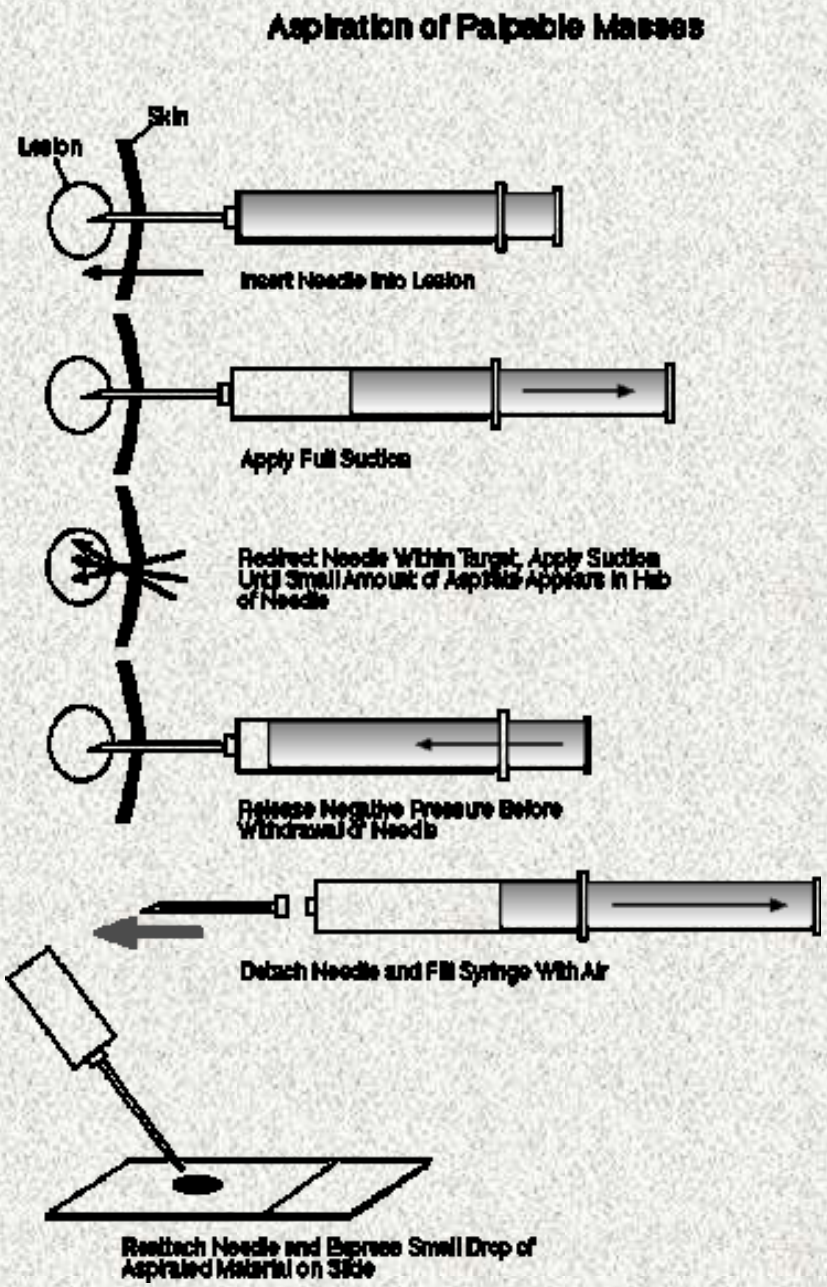
Use of needle/ syringe to penetrate lesion to aspirate contents

Aspirate: chemical exam, pathologic analysis, microbiologic exam

Indications:

- Fluid containing lesions
  - **Cysts, abscess, vascular malformation**
- Intraosseous lesions & Radiolucent lesions
  - **traumatic bone cavity, ABC**
  - **giant cell granulomas**

Technique: 18 gauge needle, 5-10 ml syringe


Aspiration of Palpable Masses
Skin
Lesion
Insert Needle Into Lesion
Apply Full Suction
Redirect Needle Within Target, Apply Suction
Until Small Amount of Aspirate Appears In Hub
of Needle
Release Negative Pressure Before
Withdrawal of Needle
Detach Needle and Fill Syringe With Air
Reattach Needle and Express Small Drop of
Aspirated Material on Slide


A "core" sample of the
gland is taken with a
needle to be biopsied

Incisional biopsy

Samples only a part of the lesion

Indications:

- Large lesion
- Hazardous location
- Great suspicion of malignancy

Principles

- Wedge shaped sample, adequate tissue
- Deep narrow biopsy, avoid necrotic tissue
- Sample includes affected area + margin of normal tissue

Excisional biopsy

Removal of entire lesion with a perimeter of normal tissue

Indications:

- Small lesions(< 1cm), appear benign
- When complete removal is possible without mutilation
- Pigmented and small vascular lesions

Principles:

- Remove entire lesion with 2-3 mm of normal appearing tissue

Soft tissue biopsy

- Anesthesia
- Tissue stabilization
- Hemostasis
- Incision
- Handling of tissue
- Identifying margins
- Specimen care
- Closure
- Biopsy data sheet

Hard tissue biopsy

- Aspiration biopsy of radiolucent lesion
- Mucoperiosteal flap
- Osseous window
- Removal of specimen
- Specimen care:
  - No crushing
  - 10% formalin

Healing of biopsy wound

- Primary intention
- Secondary intention

Healing of Extraction Wound

Five stages

- Immediate reaction
- First week
- Second week
- Third week
- Fourth week

Immediate reaction

- Blood filled socket→ coagulation
- Fibrin meshwork, entrapped RBC
- Ends of torn blood vessels in PDL get sealed off
- 24-48 hours- vasodilation, engorged blood vessels, leucocytes mobilised

First week

- Proliferation of fibroblasts, grow into clot around periphery
- Clot acts as scaffold for healing process, cells migrate here
- Clot replaced by granulation tissue, epithelium begins to cover its surface
- Resorption on crest of alveolar bone
- Endothelial cell proliferation, organization of clot

Second week

- Clot becomes organized, PDL degenerates
- Osteoid trabeculae extend outwards from wall of alveolus
- Epithelialisation complete in small sockets
- Fragments of necrotic bone get resorbed/ sequestrated

Third week

- Clot organization complete
- New osteoid forming around periphery of socket
- Osteoblasts derived from pluripotent cell of original PDL
- Cortical bone of alveolus undergoes remodeling → rounding of crest
- Epithelialisation complete in all sockets

Fourth week

- Deposition and remodeling of bone
- Poorly calcified bone→ radiolucent
- Radiographic evidence of bone formation does not become evident until 6-8 weeks after extraction
- Crest of healed socket lies lower than adjacent teeth
- Surgical extraction→buccal and lingual cortical plates destroyed
- Forceps extraction →conserves alveolar ridge

Complications

- Dry Socket
- Fibrous Healing

Dry socket

Synonyms: **Alveolitis sicca dolorosa, Alveolalagia, Alveolar osteitis**

Definition:

A focal osteomyelitis in which the blood clot has disintegrated or been lost with the production of foul odor, severe pain but no suppuration

Etiology

- Difficult/ traumatic extractions
- M/c impacted third molars

Pathogenesis

Trauma/ infection → inflammation of bone marrow

↓

release of tissue activators

↓

plasminogen to plasmin (fibrinolysis) → releases kinins

Microbiology

Fusiform bacilli, Vincent's spirochetes

C/F

- Throbbing ache caused by thermal and chemical irritation
- Symptoms start on 3rd or 5th day after extraction
- If untreated last for 7-14 days
- Foul odour, socket generally empty.
- May contain partially necrotic blood clot

Treatment

- Relief of pain
- Palliative

Healing of Fractures

Immediate effects

- Tearing of Haversian vessels, vessels of periosteum &marrow cavity
- Extravasation of blood, lack of circulation at fracture site
- Resumption of blood supply proximal to fracture site
- Death of osteocytes, dead bone extends away from fracture area
- Death of bone marrow adjacent to fracture line

Callus Formation

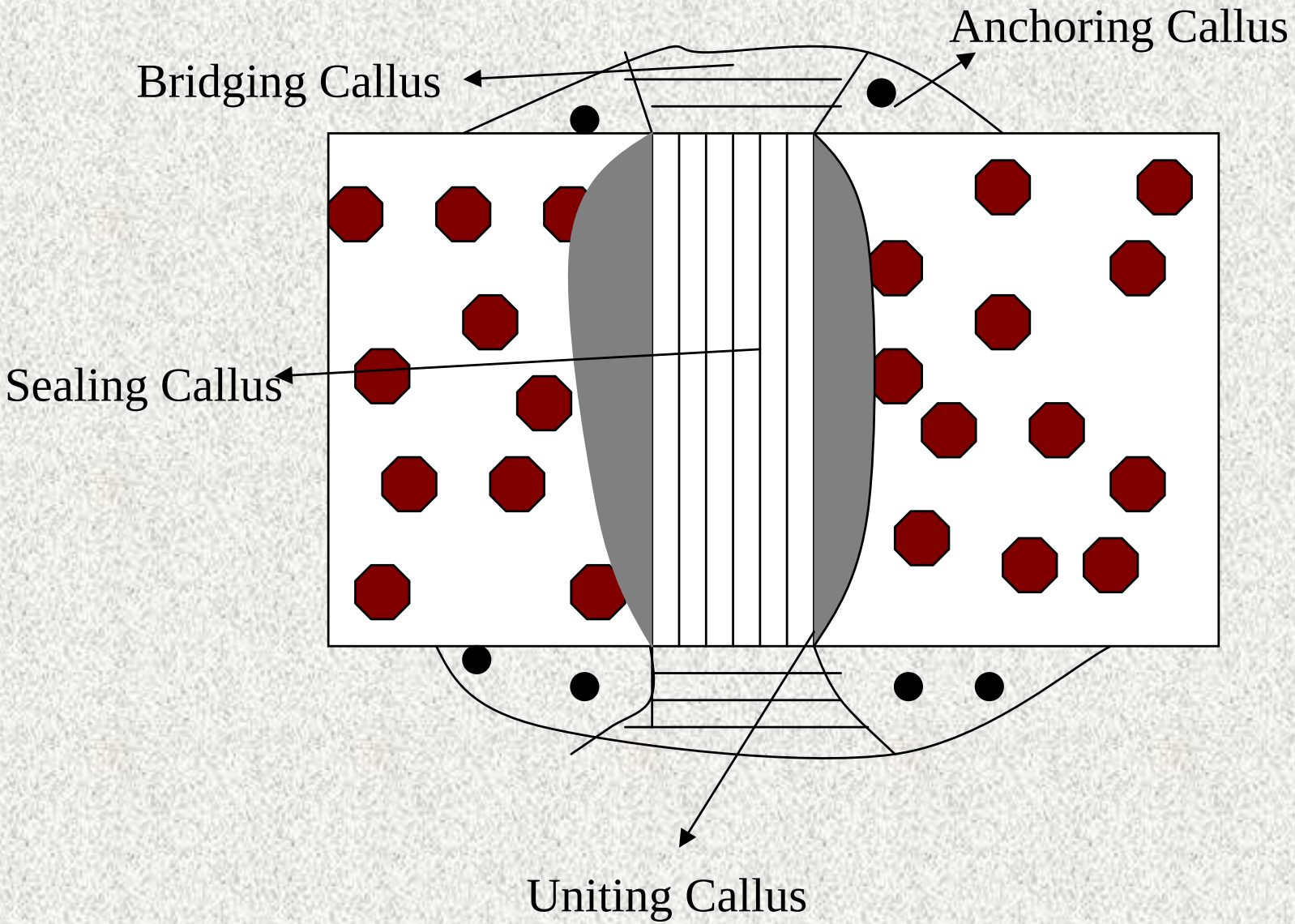
Definition

Callus is a structure which unites the fractured ends of bone. It is composed of fibrous tissue, cartilage and bone

Types

- External: new tissue which forms around and outside of fractured bone
- Internal: new tissue arising from the marrow cavity

- Cells of periosteum important in callus formation, should be preserved
- Osteogenic layer: inner layer → forms callus
- New bone: irregular trabeculae, radiolucent



TYPES OF CALLUS

Away from fracture line: chondroblasts form from osteogenic layer

Cartilage formation depends on:

- Vascularity
- Immobilization

Remodeling of Callus

Complications of fracture healing

- Non union
- Fibrous union
- Lack of Calcification

REPLANTATION/TRANSPLANTATION

DISTRACTION OSTEOGENESIS

Steps involved :

a) Corticotomy/Osteotomy

b) Latency period

c) Distraction phase → Rate
Distraction phase → Rhythm

d) Consolidation phase

Transplantation of Teeth

- Replacement of tooth damaged beyond repair by caries by another tooth
- Common tooth to be replaced- mandibular 1st molar by developing mandibular 3rd molar

Tooth banks are set preserving the tooth by various techniques-

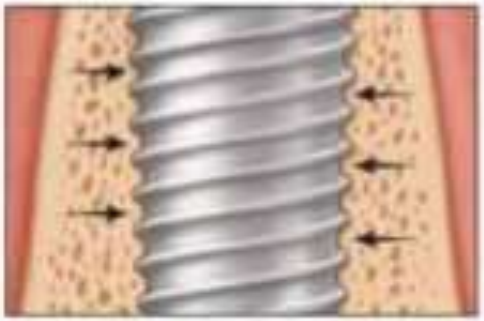
1. Regular freezing
2. Freeze-drying or lyophilization
3. Vitrification
4. Chemical coagulation by Merthiolate

Implants

- Any foreign material fixed or inserted into the body tissue
- Oral implants- support overdentures, fixed prosthesis, serve as orthodontic anchorage

OSSEOINTEGRATION

- A direct structural and functional connection between ordered living bone and the surface of a load carrying implant
- Dental implants work by a process known as osseointegration, which occurs when bone cells attach themselves directly to the titanium surface, essentially locking the implant into the jaw bone. New studies shown Osseointegration will be completed within 8 weeks.

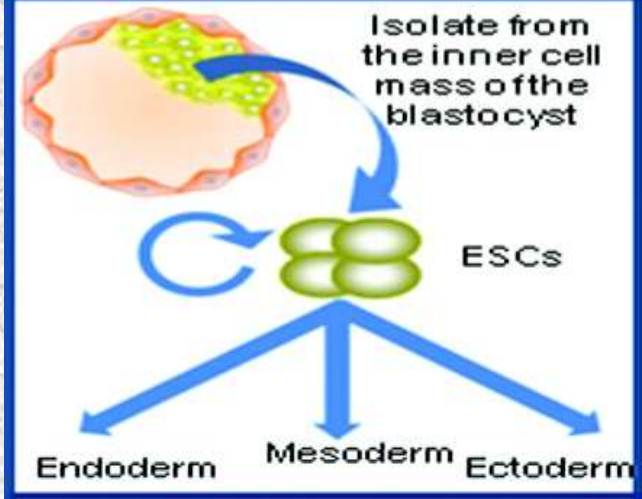


Stem cells

- Cells that have clonogenic and self renewing capabilities and differentiate into multiple cell lineages

Stem cells classification

ESCs

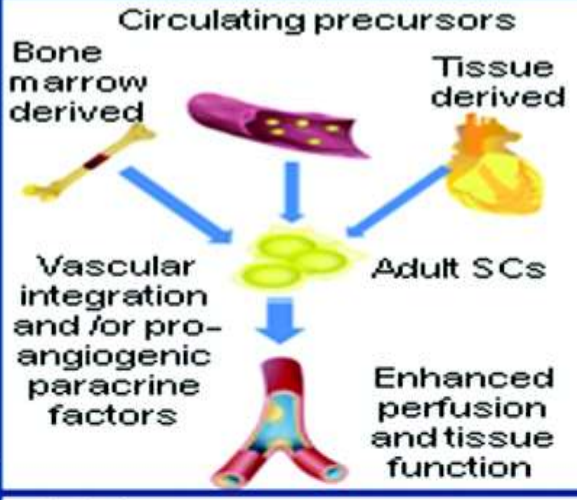


Origin:
- Blastocyst of embryo

Strengths:
- Pluripotent (3 germ layers)
- Self-renewal and high replicative capacity

Weaknesses:
- Immunological concerns
- Subject to ethical debate
- Potential for teratoma and teratocarcinoma
- Currently no clinical trial data

Adult SCs

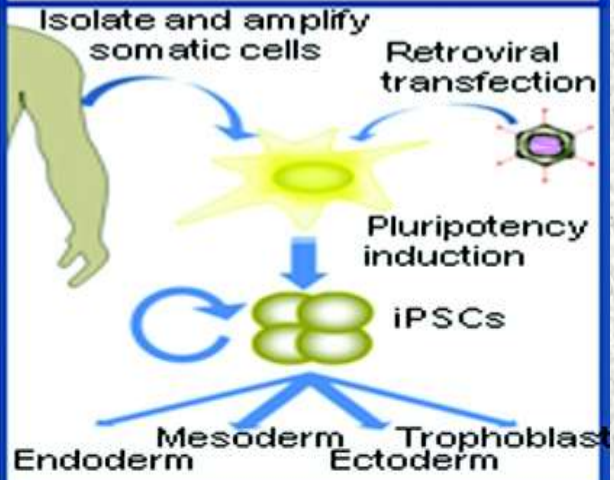


Origin:
- Bone marrow, circulation or resident tissue

Strengths:
- Autologous
- Clinical safety and efficacy data
- Typically lineage committed

Weaknesses:
- Limited number
- Limited replicative capacity
- Lineage restricted

iPSCs



Origin:
- Reprogramming of somatic cells

Strengths:
- Totipotent (3 germ layers and trophoblast)
- Autologous
- Large reservoir of cells

Weaknesses:
- Potential for teratoma and teratocarcinoma
- No clinical data

REFERENCES

- Shafer's Textbook of Oral Pathology. Eighth Edition.
- Neville, Damm, Allen, Bouquot. Oral & Maxillofacial Pathology. Third edition.
- Regezzi. Oral Pathology: Clinical Pathologic correlations. Seventh Edition.