***Sheet#10  
  
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This lecture will be about wound healing

Dr said that we have to read this lecture from the book chapter 4

We are concerned about wound healing in many cases and procedures in dentistry like extraction or repair a fractured bone

If there is healing this means tissues have already been damaged, this damage may be physical or chemical

Physical damage like:

* Surgical incision
* Crushing
* Over heating
* Over cooling
* Radiation
* Blood flow problems

Chemical tissue damage:

* Biological substances
* Certain medication
* Vasoconstrictors

All these factors can produce tissue damage so the body will try to heal itself and get back to normal by wound healing , the purpose of wound healing is to get back the integrity of the tissue

The first step in wound healing is Epithelialization: the purpose of this process is to get back the integrity of the injured tissue

The 1st step in healing any damaged tissue happen in the epithelium which is epithelialization, because epithelium works as a protective layer against microorganisms

Steps of Epithelialization

* Proliferation : increase in cell size and number to close the gap in the epithelium
* Migration : cells move from its original space to close the gap in the epithelium
* Contact inhibition: once there is contact between two adjacent cells there will be inhibition for their proliferation ( like in oroantral fistula )

In this process the sub-epithelial vessels, sub-epithelial tissue are not healed completely and the vascular tissue bed is under proliferation.

Any wound healing will go throw three phases

* Inflammatory phase
* Fibroblastic stage
* Remodeling stage

1. Inflammatory stage: starts once the tissue is injured until 3-5 days

Inflammation is a normal physiological process not like infection and it’s normal that if there is tissue damage there will be inflammation but if there is a contamination or if the pt is immunocompromised wound this inflammation will be exaggerated or it will become an infection which is a pathological process

In some patients there is no inflammation after extraction because these patients have some kind of deficiency in WBC’s like leukocytes deficiency so their wound healing will be affected because these cells will not do their job

Inflammatory stage is also called ( lag stage ) because tissues have no enough strength because there is no collagen to hold the tissue

Inflammatory stage is also divided into 2 stages

1. Vascular phase : in this stage there will be new vessels formation which is important in wound healing because the area which have good blood supply will have better wound healing

First thing happen in the tissue after injury is vasoconstriction and clotting to stop the bleeding after that we will have vasodilatation because we need good blood supply and this may produce edema which is also a normal physiological process

1. Cellular phase : WBC’s start to work and get rid of foreign bodies and damaged cells
2. Fibroblastic stage : in this stage fibroblast and new cell will be introduced in the tissue

First fibrin will be introduced and make a mish ( crisscross ) that act as a guide to other structures

In this stage if a trauma happens to the tissue this mish will be destroyed and the healing will have to start all over again which make the healing slower and this also apply if there is a fracture in the bone in the mandible. For example, the two pieces of bone must be fixed together so the mish network is not disrupted

After that fibrinolyses will happen to fibrin fibers and it will be replaced by collagen in higher quantities and usually this process will end after 2-3 weeks we will be introduced in the new tissue then new capillaries and blood vessels will be formed but the tissue will only get around 70-80% of its tensile strength

1. Remodeling stage : in this stage tissue will try to get back close to its original form

This stage will continue forever because remodeling is a normal process

1. Wound contraction : it’s a normal process but if it’s too much a pathology will happen which is scaring

If there is no proper wound healing, then extraction of teeth can’t be done, and usually complicated surgeries are due to prolonged wound healing.  
  
there are factors that interfere with wound healing, like:  
foreign materials “dirt, suture material”  
necrotic tissues “necrotic tissues if present in the wound “in crush injuries for example”, then they ill interfere with wound healing.  
bacteria  
hematoma  
ischemia “this can be due to problems in the patient’s blood supply, or due to increasing the tension of the tissue when you return to its place after a surgery “after a surgery the tissue should return to their original location passively”.  
  
there are three types of healing:  
-primary; when the two edges of a wound are close to each other “no gap between them”, and this type results in better healing, less inflammation, less scaring, faster healing. Like a cut wound.  
-secondary: here there is gap between the edges of the wound, so the healing will be slower, the scarring will be more, the inflammation will increase, like the extraction socket, poor reduced fracture “reduction of a fracture: is to return the two ends of a fractured bone to their original position,, reduction can be; open reduction(to put screws on the bone), or close reduction”  
-tertiary: here the gap between the edges of the wound is so big that a graft must be taken to close this gap.  
  
regarding the healing of extraction socket:  
it’s secondary healing, the extraction of a tooth initiates inflammatory reaction “that’s why we can give NSAID’s after extraction”, then “epithelization” happens, which means that the two ends of the extraction socket will start getting closer to each other, and epithelization normally ends in the first week, then fibroplasia and remodeling “by osteocalsts and osteoblasts” begin (it’s important that after extraction a blood clot forms)  
  
In 4-6 weeks the epithelium will become 100% intact, and 4-6 months are needed for the bone to be formed “on the x-ray”, within 1 year a scar will result (these durations depends on systemic and environmental factors)  
  
note: all the bone in the extraction socket will be removed by the osteoclasts “and then a new bone will form”, because it’ll be contaminated from the oral cavity.  
  
-Bone healing:  
here inflammation, fibroplasia, and remodeling also occur.  
 the first type of bone that forms during bone healing is called “callus” (which is additional bone formed during early stages of bone healing around the edges of the fracture, then it’ll be removed during time)  
the most important thing regarding bone healing is fixation “stability”.  
the presence of movement during healing of fractured bone is bad, but the presence of slight movement during the healing is good “and is termed functional matrix concept” which means that the formation of the bone will be affected by the soft tissue and movements surrounding it.  
  
Healing in the maxilla is better than in the mandible (because of the good blood supply of the maxilla compared to the mandible)   
  
Nerve healing  
can happen during extraction of a tooth “like extracting the lower 8 can cause trauma to the lingual nerve or ID nerve”, genioplasty, orthognathic surgeries or due to tumors, jaw fractures, and resections.  
genioplasty : is the addition or removal of bone in the chin area.   
  
-If crushing happens to the nerve then the possibility of recovery is high. “and it causes parasthesia”  
-If complete cut happens to the nerve the possibility of healing will be lower “and it’ll depend on how much the ends of this cut nerve are close to each other”. “and it causes anesthesia”   
that’s why the possibility of healing of a cut injury in the ID nerve is higher than the cut injury in the lingual nerve “because the ID nerve is present inside a canal and its ends will remain close to each other even after it’s cut”