Perio lec. #12

Gayda Abdullah AL-faraheed

Plz refer to slides

The dr reviewd what he gave us last lec. In headlines.

Bone grafts are :

1-autogenous. 2-allogenous. 3-xegenous. 4-alloplastic material.

2-allogenous bone grafts are osteoinductive.

Types:

1-DFDBA:demineralized freezed dried bone allograft.

2-FDBA:freezed dried bone allograft.

DFDBA is better .why?we will answer it later.

Osteoinductive means material that can induce bone formation of bone in non bone site means; if I take the material and put it subcutanuos in any organism it will form bone like tissue / the molecules in this material is capable of inducing the formation of osteoblast that will in return cause bone growth.

Allogenous BG. means material taken from1- the blood or dermis ?of the pt that will receive the graft for exp:in pt which we took the whole hip and put hip prosthesis instead 2-any other pt undergo bone surgery and the bone is sound,intact,healthy.

Bone undergo freezing to kill all the organic material including microorganism and other then drying to remove all killed organism bcuz some content being killed still cause a problem like proteins which may cause immune rxn so it have to be removed and what left after that is only BONE STRUCTURE+BMPS (bone morphogenetic proteins) which are proteins that will draw the skeleton and without them human being can’t exist !

These proteins are the initial signal in early stages that will induce bone formation through the activation of the differentiation of stem cells into osteoblast after bone blocks denature and release BMPS .and that’s why we call the material osteoinductive.

Back to the qs why DFDBA better ? bcuz the BMPS are more exposed.

Q:what is the difference between osteogenic and osteoinductive?osteogenic:they contain bone cells. Osteoinductive:induce bone cells formation.

3-xenogenous bone grafts are osteoconductive .why? bcuz they don’t have bone cells or signaling molecules so there is only the scaffold …bone cells and stem cells adhere to its surface and then they will start forming a new bone .

Bone cells in lab can be maintained viable/vital in solution but they will never function (form bone) unless they are attached to scaffold …(كلما زادت تشعبات الخليه والattachment مع scaffold كلما كانت الخليه more active .)

Types of xegenous bone grafts:

Anorganic bovine bone ((اكثر ماده مستخدمه

All the organic material is removed whaenerate zero wall defect whatt remain is the hydroxyapatite (architecture) studies have shown that these materials have no effect in horizontal and zero wall defect.

We remember that (autogenous bone+ DFDBA) it has been shown that they can regenerate zero wall defect (horizontal bone resorption) horizontal bone resorption mostly seen in chronic periodontitis.

But also (autogenous bone +DFDBA) have been also show to induce bone formation in this type of defects ,the studies where retrospective ومش منطبقه على جميع الحالات .

Anorganic bovine bone currently 1-has no effect in regeneration of horizontal /zero wall defects 2-availability( ( الميزه الاساسيه .

4-alloplastic materials they are synthetic -mainly-or based on natural products .

Types:

1-ceramic ….1-hydroxyapetite HA. 2-tricalcium phosphate TCP.

2-biocompatible composite polymers.

3-bioactive glass ceramics.

1ceramic –HA dense HA doesn’t induce new bone formation according to the studies what happens mainly is fibrous encapsulation and formation of long junctional epithelium –on histological level-

-on clinical level-we will get a results which are gain of attachment ,reduction of the pocket depth ,better tissue response.

So histologically I didn’t get regeneration what happen is REPAIR (fibrous encapsulation+ long jun.epi.)

HA properties depend on :

1 -physical +chemical inherited properties …affect the rate of resorption

2-density…affect compressive strength

3-porosity…v.important factor …affect vascular ingrowth.

4-size of particles…affect resorption,vascular ingrowth,bone formation

Large particles are non resorbable.

1-ceramic TCP

Beta(size of particles, porosity) controable like dense HA doesn’t induce formation of new bone , rate of resorption depend on porosity+particle size.

2-calcium carbonate …same as slides…it has similar structure to our bone and genetically its v.similar to it.

Most studies showed that its completely resorbable but some showed some fibrous encapsulation meanind its non resorbable .

3-biocompatible composite polymer …same as slides

4-bioactive glass ceramic …زجاج عادي once placed in an aqueous organic solution or environment what happen is 1.ionic dissolution of ceramic particles.2.silica gel layer.3.calcium phosphatelayer connected to hydroxycarbonate layer .

Na released /Ca take its place.

Also REPAIR more than regeneration .

So biocompatible composite polymer +bioactive glass ceramic give clinical results similar to autogenous bone grafts !

End of part 1 of lec 12

Part 2

Principles of GTR

Nearly in 80s they made studies to find how these (pdl tissues) behave when there is defects and that defect is being treated .

They found that the procedure that happen during the defect is being treated is COMPARTMENTALIZATION …it’s a very simple principle that proposed by Metcher 1976 ,it’s the core stone of the current regeneration medicine القائم على استخدام membaranes.

The principle state that depending on the cell type that occupy the regenerative space the result will be different .

Examples from the slide plz refer to them …pdl fibers by definition they are perpendicular fibers reinserted on bone-cementum and cells.

From this point (compartmentalization) they started ways to separate different tissues ,and the way was to place a membrane between the gingiva ( in epithelium or connective tissue) and bone /pdl and this will allow more time (the most important factor at least in 80s) that should be controable bcuz the epithelium and connective tissue of gingiva 24:48 (cant hear) bone +cementum growth factors.

Acutually what is needed is a membrane to separate these tissues and the space and this membrane should have same 25:56 (cant hear)

If the tooth was extracted but there is a bone defect and I need to place an implant we must do bone regeneration by placing a membrane which known as GBR NOT GTR.

Based on that membrane investment developed and this is one of the examples that show dentistry can influence medicine …زمان كانو بيسكرو skull ب plates لكن الان بيستخدمو membranes (GBR)

Membranes in GBR are of 2 types :1-resobable. 2- bioresorbable.

Ideal membrane requirements :

1-biocompatible/non toxic .

2-cost effective.

3-easy to handle/elastic.

4-cell exclusion which mean cells cant penetrate membranes or go through them .

5-space maintanence to be able to that there must be minimal shearing and tensile strength for the membranes, not to collapse.

6-tissue integration means tissue can attach to it.

7-some biological activity.

1. Non resobable membranes :
2. ePTFE most commonly used named GOTEX used a lot in sutures .
3. miscellaneous mambranes expensive they made change to it :

–millipore membrane –rubber dams

3.titanium meshsor membranes ..new type like tents fixed with screws /few weeks then removed.

To achieve the best results when using non resorbable membranes : 1-enough keratinized gingiva 2-thick surgical flap why? To prevent surface exposure and bacterial entering which caused bcz the membranes surfaces harbor bacteria and if bacteria enter it will lead to membrane failure.

-healing min (4-6wks) ideally (12-16 wks) for proper bone formation

-probing means that we are talking about GTR ..no probing for (3-6 mnths)

-Radiographic evidence of bone formation take to appear (6-12 mnths) after surgery .

-perfect OH to prevent tissue perforation which if happen there will be trauma ,injury to tissue ,edema, bleeding,infection especially in non resorbable membranes which will force us to remove the membrane.

2- bio resorbable membranes types :

1.polyglycoside synthetic…polylactate,polygalactide copolymer.

2.collagen type 1 or type 1+3 which are mostly used may be proxin or povine .

Collagen type 3 percentages fifer in membranes why? Bcuz it help to strenghthen of type 1 by crosslinking.

Elastic fibers are not the same as collagen .:)

Cross linking of type 3 effect :

-ease of handling of mambranes /elasticity( increase type 3 ..increase ease of handling)

-rate of resorption ( decrease type 3 ..decrease resorption)

-resorption ابطأ elasticity اقل minimal inflammatory rxn.

Bioresorbable membranes are easier to handle than non resorbable , more comapatible …no need for 2nd surgery , timing of resorption can be regulated… their prblm compared to non is lack of rigidity consequently cant be used in lip space bcz they will collapse.

Results for resorbable and non resorbable :

1. decrease pocket depth..
2. clinical attachment gain.
3. Bone fill.

-in slidesmembranes in classii furcation defect (mandibular buccal classii )is the only predictable site bcuz lingual side is v.difficult to access and max. are non predectible (mostly class ii in them is combined or we cant see it)

-الجدول حفظ

- using GTR means putting membrane just but we can put bone grafts and cover it with membrane and the benefit would be save he shape especially in resorbable membranes which is mostly used (by trend)

Statiscal studies showed no difference between results in using BG+membranes or membranes alone so I can use any !

-new approaches to periodontal regeneration :

2008-2010 there were an alternatives to GTR and BMPS they were mostly useless (when looking to their biological activities)

Its only cost more, more traumatic,more morbidity to pts.

So why they start thinking of alternatives? Bcuz old ones were unable to regenerate terminal defects.

Examples of new approaches:

1. Enamel matrix derivative EMD which based on understanding bone formation +pdl.

Pdl formation require the availability of amelogenesis which come from ameloblast

2-growth factors

3-platelet rich plasma PRP.

4-BMPS

5-gene therapy.

6-tissue engineering.

1-EMD:

Group of proteins present during tooth formation its only source is developing teeth of PEGS

Hertwigs epithelial root sheath contain :amelogenins+ameloblastin+enamelin+vehicle(PGA: propylene glycol alginate )

Vehicle deliver the gene to its target and prevent its resorption.

EMD approach mostly used in cancer and diapetology(through targeted gene therapy of the used langerhan cell ? ) bcuz they targeted regeneration of magnificent cells ?

The mechanism of work :

The material precipitate on root surface /granulation tissue and clot formation then this material will promote and have some impacting effect to promote migration and the adhesion of mesenchymal stem cells (from PDL) on osseous once this happen I can guarantee BETTER chance for regeneration . then proliferation of mesenchymal cells happen /cytokine production to induce more adhesion ,more proliferation and differentiation. Then differentiation of these cells into CEMENTOBLAST ,deposition of new cementum ,insertion of pdl fibers into the newly formed cementum and then filling the defect with new pdl tissue and formation of bone until the complete regeneration.

What EMD do compared to bone grafts or GTR ? regenerate cementum,…etc ( same as slide )

-جدول growth factors غير مطلوووب \_

-the only Growth factor with an evidence that it cause bone +pdl regeneration is PDGF the studies 2005,2006,2007 then they stopped bcuz PDGF +BMPS uncontroable and their behavior if thy enter systematically (in blood) is un predictable.

-factors affect GTR …same as slides.

Q what FMBS AND FMPS stands for? Full mouth bleeding spots and full mouth pocket spot .

* Better treatment out comes for narrow + deep defects.

Gd luck all ;

`