SIMULTANEOUS GUIDED BONE REGENERATION AND IMPLANT INSERTION

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DEFINITIONS

REGENERATION: The reconstruction of damaged or destroyed tissue resulting in the reconstructed tissue being identical to the original tissue in composition, morphology and function.

REPAIR: The reconstruction of damaged or destroyed tissue, where the reconstructed tissue is consequently different from the original tissue (scar or Long JE).

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BACKGROUND

Guided bone regeneration is based on guided tissue regeneration in the field of periodontics. In 1974 it was suggested that the way a lesion heals depends on the type of cells populating that lesion (Melcher 76). It was also determined that when the membrane was crushed and only a small space was left between it and the tooth, only cementum and a small amount of bone were formed. However, when the membrane maintained more substantial volume, a large amount of new bone was formed (Gottlow 84).

Subsequently, a series of papers found that PDL cells are the type of cells responsible for guided tissue regeneration, and that the prevention of epithelial and connective tissues from reaching the healing area by means of a physical barrier (membrane) allows the PDL cells to populate the roof of the tooth and bring about the formation of cementum, PDL and bone (regeneration).

The conclusion drawn from the series of papers was that it is possible to extrapolate from the principle of successful guided tissue regeneration to bone regeneration alone, by creating a space and a physical barrier that permits only bone-forming cells to penetrate the space and fill it with bone. This theory is the current basis for guided bone regeneration. Pursuant to this theory, several clinical studies were conducted in which bilateral bone defects were created and a membrane was placed on one side but not on the other. The research results unequivocally demonstrate that new bone was generated on the side on which a membrane was placed, whereas only soft tissue was generated on the other side (Dahlin 88, 89), Kastapoulus & Karring 94, Karring 94).

The entire process takes from 4 to 6 months (Schedek 94).

THE BONE FORMATION PROCESS

Histological evidence shows that new bone formation under the membrane takes place following the same process, and in the same phases, as native bone formation in the alveolus after a tooth extraction, namely:
1. Blood clot formation protected by the membrane
2. Granular tissue formation
3. Woven bone formation
4. Lamellar bone formation
5. Bone remodeling

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Clinical studies comparing implants inserted into regenerated bone vs. implants inserted into native bone show the following:

- Both share the same clinical, radiographic and histomorphometric characteristics.
- There is a similar degree of bone - implant contact (BIC).
- There is a similar degree of crestal bone resorption (Fritz & Reddy, 2001; Zitman, 2001; Hammerle, 2003).

**PRINCIPLES OF GUIDED BONE REGENERATION DEMONSTRATED WITH IMPLANT 22**

In a series of case presentations and studies, Buser (1995) proposed a surgical protocol comprised of 7 principles aimed at achieving predictable results in guided bone regeneration:

1. **Primary closure of soft tissue to prevent membrane exposure**, using an appropriate incision and flap elevation technique.
2. **Placement of the implant in ideal rehabilitative position**.
3. **Bone preparation - decortication** aimed at enabling osteoprogenitor cells from the bone marrow to reach the defect. A number of papers published in the recent years showed that decortication is not necessary in order to achieve predictable results.
4. **Creation and maintenance of a sub-membran al space**, aimed at preventing a prolapse of the membrane into the defect, through the use of bone substitutes or other means of membrane support.
5. **Close adaptation and fixation** of the membrane by means of suturing, or fixation to the bone with pins, aimed at:
   - Preventing the penetration of soft tissue cells into the defect area
   - Preventing the displacement of the membrane in order to avoid soft tissue formation underneath
6. **Achieving primary closure by means of releasing incisions and suturing**.
7. **Following a healing period of 6 to 7 months to allow maximum healing and bone-fill**.

**SUMMARY**

- Guided bone replacement regeneration is an efficient and predictable procedure.
- 90-100% of bone filling under the membrane after a waiting period of 6-8 months (Long N.P.: COIR 94, 5, 92-97).
- There is no difference between regenerative bone and native bone regarding BIC and the success rate of implants (Zitman NU, JOMI 2001:16:355-366).
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