Today guided tissue regeneration (GTR) and guided bone regeneration (GBR) are standard procedures in surgical practice. The first attempts at osseous regeneration of a bone defect, excluding influences from connective tissue, by using cellulose acetate filters were taking place at the end of the 1950s (Hurley et al. 1959).

Indications for Guided Tissue Regeneration

Today membranes are used in the following areas:

- Dental implantology—with pre-implantological preparation of the alveolar crest and all forms of implantation.
- Periodontology—to replace lost periodontal structures and for periimplantitis treatment.

Membranes are intended to prevent the proliferation of connective tissue cells into a bony defect, create and maintain an artificial antrum in which the bony regeneration can take place, be biocompatible and cell occlusive, and provide some protection against infections. Clinical manageability needs to be ensured with their use.

Classification of Membranes

Today a range of membranes is available for which a classification into resorbable and non-resorbable membranes appears logical. There are two biologically degradable product classes:

1. Synthetic polymers such as polyactides (Guidor®, Epi-Guide®) or polyglycolides (Vicryl®) and their chemical modifications (Gore Resolut®, Artisort®), and
2. Xenologous collagens (Bio-Gide®, BioMend™, bovine origin).

The materials in the first class are dissolved into small fragments by hydrolysis and undergo phagocytosis. Collagens are resorbed by collagenases and proteases (Schlegel 1996, Heinzer et al. 1998). For the non-resorbable membranes, comprehensive clinical and experimental reports with e-PTFE expanded polytetrafluorethylene (GoreTex®) and PUR aliphatic polyurethanes (bone-up®) are available (Buser et al. 1984).

Barriers from calcium sulfate (Captor®) or titanium in net, lattice or wire form (Frios® Bone Shield, Tiomesch) have their uses (Paulus 1996, Einsteigerhandbuch 2000). Today two types are favored: the resorbable collagen membranes and the non-resorbable e-PTFE membranes (Watzek 1999). The advantage of resorbable membranes is the low degree of stress on patients due to the absence of an exposure operation, which allows protection of soft and hard tissue structures. It is important to note that not only resorbable materials must be biocompatible during the implantation phase, but also waste products from decomposing membranes. Moreover, re-ossification of the defect region at the time of disintegration of the membrane should have occurred. A period of three months is thought to be ideal for this (Schlegel 1996).

Membranes & Bone Replacement Materials

Membranes are often used in combination with bone transplants as spacers or fillers. Different antrum fillers are used:

- autologous bone,
- bone mineral structures (calcium phosphate ceramics [Cerasorb®] and xenogenic materials [Bio-Oss®]),
- homologous bone products (FDRA freeze-dried bone allo-graft) or
- collagens (in liquid, paste, sponge or membrane form).

When selecting, consideration needs to be given to what extent the bone regeneration is passively influenced by the spacer (Schlegel 1996).

Complications with the application of membranes are, for example, membrane expositions caused by dehiscence (depend- ing on the author, this is between 4% and 80%). With non-resorbable membranes removal is necessary due to the therapy resistant bacteria colonization of the surfaces and the resulting osteolysis. The TefGen® membrane is an exception as it can remain in situ for three to four weeks in case of accidental exposure.

Clinical studies with resorbable materials have shown that after their exposition and with daily cleansing with 3% H2O2 and 0.12% CHX, removal is only necessary after eight weeks post implantation (Urban et al. 1995). Different authors reported a failure rate of between 5% and 60% with resorbable membranes (Buser et al. 1994, Becker et al. 1995). There is a risk to patients with the use of materials of bovine origin due to possible allergic reactions and infectious diseases (for example, B. This is not the case with synthetically produced materials as these are pure.

For the future, it can be assumed that the development of existing and new membranes, particularly in combination with bone formation inducing and accelerating materials (for example BMP, PRP), will progress. Furthermore, the techniques for replacing lost bone structures will be further optimized due to their wide use.

Clinical Case Examples

Following is documentation of the use of different augmentation systems and membranes using case examples. As some operations were performed abroad, materials that aren’t yet approved in Germany were used.

Case 1: front tooth trauma, upper jaw
The 41-year-old female patient lost her incisors (11, 21, 22) in an accident approximately 25 years ago. When she came to the practice she had had implants two years ago that had to be removed three months later. After explantation, no measures were taken to rehabilitate the lost bone. The missing teeth have since been replaced by a provisional bridge (Fig. 1).

The extent of the jaw bone loss through atrophy and as a consequence of the lack of augmentation can be clearly seen on the palatal and lateral views (Fig. 2). The pillar teeth had root treatments and were provisioned with pins (Fig. 3). After checking the reten tion worthiness and doing an appropriate root canal treatment of the remaining teeth, an augmentation to create an alveolar crest in which implants can be inserted was planned. The procedure had to be performed in two phases in this instance as the primary stability with an immediate implantation could not be guaranteed.

The missing bone parts were replaced with Cerasorb® after surgical exposure involving a slightly palatally positioned paramarginal incision (Fig. 4).