Use of the magnetic mallet in bone-shaping and implantology. A technical report

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Bone-shaping
Oral implantology
Surgical Technique

ABSTRACT
Aim: The aim of this study is to report the favorable results obtained and the surgical technique using the Magnetic Mallet for shaping the bone by means of replaceable osteotomes, chisels, implant bed shapers, bent pieces placed in the handpieces of bone-modelling equipment controlled electromagnetically.

Materials and methods: The Magnetic Mallet technique was developed in 2012 and in the present study it was applied on a sample 269 subjects in bone-shaping, implantology and a wide range of oral and implant surgical interventions.

Results and conclusion: In the case of risk patients and lesser bone mass, the Magnetic Mallet makes it possible to prepare implant sockets by splitting and expanding the bone with minimal bone loss; with implants (especially with specific surface properties) its application increases the chance of success, even in high-risk cases. Its application allows bone preservation even in case of teeth and roots extractions and can be well combined with other surgical techniques.

Introduction
Bonwill was the first to apply a magnetic mallet in dentistry, and had it patented under the name of electromagnetic dental mallet on 21 July 1873. The aim of the device one and a half century ago, in case of hammered gold fillings, was to achieve even and mild mechanical hitting effects of predictable forces, which made the dentist’s work significantly easier, increased the precision and, at the same time, the efficacy of fillings. The oral surgical/implantological application of the modern magnetic mallet of the 21st century was reported by Crespi in 2012, describing his experience while carrying out sinus lift. He compared the procedures with traditional hammers and osteotomes with the potential ways of application of the new magnetic mallet (2).

The equipment of the Magnetic Mallet (MM) consists of a central unit, on which the force of mechanical blows can be adjusted. A sterilizable handpiece is joined to it, into which various replaceable tips can be fitted. The mallet can be operated by a pedal (1).

In the device, the hitting force of MM is adjustable: 75-90-130-260 kp. This means multiple (6-7 fold) efficacy compared to the maximal force of 40 kp of traditional hand mallets (Figure 1).

The fastest blow that one can carry out with traditional mallets comes to about 350-400 microseconds, whereas the duration of a hit by MM is 1/4 or 1/5 of that. The impulse of hitting is extremely fast: about 80-100 microseconds. Due to the extremely short period and to the inertia of living organisms to fast impulses, despite the relatively great force of hitting, patients can experience just minimal discomfort. They can feel considerably lower blow than in the case of traditional mallets and chisels. Dizziness following surgery caused by the hits using traditional mallets, probably resulting from the dislocation of the auditory ossicles, can be avoided.

The fastest blow carried out by a traditional mallet comes to about 350 microseconds, whereas that by MM is one-fourth or one-fifth of it (Figure 2). It can be ascribed to its extremely great acceleration that, because of the inertia of the skull, the mechanical force of the blow, in the vast majority of cases, is primarily directed to the plastic change of the shape of the bone and it is just a small part that moves the skull.
On the contrary, a considerable part of the relatively slow handpiece is directed to moving the skull and just a smaller part to the change of the shape of the bone. In other words, the energy of MM almost entirely promotes the creation of a plastic effect (bone-shaping) with just a slight change in kinetic energy. By contrast, a handpiece of slow blows produces far more kinetic and less plastic energy resulting in less change in shape.

Similarly to the handpiece of the micromotor, the handpiece of MM can be autoclaved and there are various replaceable tips at our disposal, in two sets, straight and curved ones. Among them there are chisel tips, applied for bone splitting, but they are suitable for bone cutting as well. There are narrow, flat tips, blades for displacement of roots and teeth (Figure 3, 4, 5, 6, 7).

For the preparation of implant sockets there is a whole series of expanders, implant socket formulating tips at our disposal. Bone expanders with diameters of 1-2-3 and 2.3-3.3-3.6 mm are suited for both the preparation of implant sockets and bone condensation. As a third set, machine handpieces and tips to remove crowns and bridges can also be ordered.

To sum up the characteristics of MM procedure: the very short – 0.1 sec – little hitting effect on the bone of controllable depth and force is to be underlined; the device can be held in one hand, so the other hand of the operator is free; it creates excellent visibility. It is a minimally invasive bone-shaping device, which is capable of separating bone tissues without any bone mass loss, there are no shavings (3, 4, 5).

Force of application can be adjusted in four scales: 75-90-130-260 kp, thus the force of the blow is 6-7
fold compared to traditional mallet-chisels. Blow is extremely fast of short impulses, 4-fold compared with the blow of traditional mallets. Owing to this 0.1 second hitting impulse, the head of the patient receives the blow just partially as it cannot follow the fast impulse and is “inert”.

A further great advantage of the MM technique is the fact that it does not require any cooling fluid and when splitting by MM during the preparation of the implant socket, the usually little and less viable bone mass is not “washed out”. In contrast to rotary instruments and piezo, due to the fact that cooling is not needed, the substances (minerals) inevitable for starting ossification and osseointegration and that are normally found in a “living” bone, are not rinsed out. The bone is slightly bleeding and shows signs of life. Following the application of MM, the blood in the surface of bone is abundant and is of living color, compared to the state after bone-shaping by a micro-motor or piezo, where, in many cases, the surface is whitened and is “washed out”. The bone expanders of MM, the so-called root-form expanders are suited for the preparation of bone sockets which correspond to the outer shape of most root-form implants. In the case of implants with cutting edges, implants can be usually screwed into the bone socket prepared by MM expanders (Figure 8).

If it is necessary, the bone socket determined by MM expansion can be further refined and shaped with the final drill and/or thread cutter of the specific system of implants by the help of a handpiece – a ratchet spanner (without any cooling fluid).

By the help of the double-curved instruments, the site of the alveolar ridge in the position of the second molar in the lateral region can be reached (Figure 9).

Various sets and complementary tips also include bone-cutters, chisel tips, tooth-, root- and superstructure-removing tips. This technique can be primarily used for the preparation of implant sockets and also for bone-condensation in the case of less bone mass and non-hard bone (Figure 10, 11, 12, 13).

Figure 3 - A series of tips for chiseling, splitting and preparing of implant sockets. The set contains straight pieces, another set contains bayonet bent tips. This latter set can be applied in the molar region of the oral cavity as well, at an appropriate angle it can be used for both the lower and the upper jaw bones.

Figure 4 - The MM equipment. The device consists of a central unit in the frontal part of which blows of 4-degree force (1-2-3-4) can be adjusted. A sterilized handpiece cord can be attached to it, as well as a pedal. Pressing down the pedal once results in one blow. To produce a series of blows, the pedal should be pressed down and let up rhythmically. Continuous pressing of the pedal produces only a single blow.

Major fields of application of the MM (Table 1)

Tooth and root extraction
- MM-assisted removal of tooth and root.
- Removal of tooth and root and instant placement of implant by MM.
- Delayed placement of implant into the alveolus, by MM.

Bone condensation and expansion by MM
- Bone condensation.
- Horizontal bone expansion.
- Vertical bone expansion.

Sinus lift by MM
- Transcrestal sinus lift.
- Sinus lift completed with local bone management.
- Sinus lift performed simultaneously with tooth extraction.

Other applications of MM
- MM-assisted orthodontic treatment.
- MM-assisted root apex resection.
- MM-assisted impacted, retained tooth root removal.
- Removal of crowns, bridges and implant parts.

Patients and methods

THE MM technique (6, 7) was applied for 269 patients (98 males and 171 females) at the Gáspár Medical Center in Budapest (Hungary) between October 2014 and April 2016 (Table 2, 3, 4, 5).
During tooth and root removal thin, blade-shaped tips prepared for the equipment were used, with which, in the gap between the tooth or the root and the bone, going inward by rhythmic blows, transecting the fixing elements, the fibres fixing the tooth could be detached. Reaching the appropriate depth, in some cases with tooth forceps, with a light motion, the root could be lifted out. In other cases, the tooth could be moved to such an extent that it was possible take it out of the alveolus with tweezers.

While extracting the tooth, it was possible to preserve the bone edges but the soft tissues had to be treated with special care. Papillae could remain sound or suffer just minimal compression. Thus, for the conditions of immediate implantation, it is possible to ensure the greatest possible preservation of the bone and soft tissues.

In case of multi-rooted teeth, transection of the crown and the neck of the tooth can be carried out by a rotary instrument or piezo, then, by MM, they are treated as single roots and moved out of the alveolus with the thin blade of MM. Following this, it is possible to prepare an implant socket with MM by horizontal expansion.

For bone condensation, MM tips are applied which condense laterally and, in an order widening upward, we use them one after the other (1 mm, 2 mm, 2.3 mm, 3 mm, etc.). The rather soft, in many cases D4 bone, can be condensed to D3 and D3 quality to D2.

In case of horizontal bone expansion, often in a ridge with a width of 5-6 mm, it is possible to carry out widening with MM tips of increasing width without shaving off any of the already little bone mass. In the case of a very thin and quite rigid bone, the operation is started with splitting, then, at an appropriate depth, in a ditch of 10-12 mm, it is possible to further widen the split bone with implant-shaped tips (Figure 14). In the case of a rigid 3-4 mm ridge end, the shaping of the corticalis can be started and the first millimeters by piezo, then continued with an MM blade and chisel.

During the removal of impacted and retained teeth, the site between the tooth and the bone mass can be accessed and, by expanding the bone slit, the tooth is gradually moved out. Meanwhile, it is possible to support the operation by either a piezo or a drill.

Sinus lift is also possible with various special MM tips, as well as thickening the bone layer with tips of

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Table 1 - Distribution of interventions by means of MM based on type of surgery

<table>
<thead>
<tr>
<th>Type of intervention</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of tooth and immediate implantation</td>
<td>27</td>
<td>44</td>
<td>71</td>
</tr>
<tr>
<td>Bone condensation</td>
<td>28</td>
<td>55</td>
<td>83</td>
</tr>
<tr>
<td>Horizontal expansion of the bone</td>
<td>27</td>
<td>39.6</td>
<td>6</td>
</tr>
<tr>
<td>Vertical expansion of the bone</td>
<td>4</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Removal of impacted tooth</td>
<td>7</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>Sinus lift</td>
<td>5</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Összesen</td>
<td>98</td>
<td>171</td>
<td>269</td>
</tr>
</tbody>
</table>

Table 2 - Distribution of patients by gender in case of implants placed with MM

<table>
<thead>
<tr>
<th>Patients</th>
<th>Number of patients</th>
<th>Number of implants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>98</td>
<td>189</td>
</tr>
<tr>
<td>Female</td>
<td>171</td>
<td>240</td>
</tr>
<tr>
<td>Total</td>
<td>269</td>
<td>429</td>
</tr>
</tbody>
</table>

Table 3 - Distribution of implants placed by means of MM based on their types

<table>
<thead>
<tr>
<th>Type of implant</th>
<th>Number of implants</th>
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<tbody>
<tr>
<td>SGS</td>
<td>319</td>
</tr>
<tr>
<td>Straumann</td>
<td>59</td>
</tr>
<tr>
<td>MIS</td>
<td>51</td>
</tr>
<tr>
<td>Denti</td>
<td>3</td>
</tr>
<tr>
<td>Paltop</td>
<td>8</td>
</tr>
<tr>
<td>Összesen</td>
<td>429</td>
</tr>
</tbody>
</table>

Table 4 - Distribution of implants placed by means of MM on the basis of jaw bones

<table>
<thead>
<tr>
<th>Jaw bone</th>
<th>Number of implants (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxilla</td>
<td>279 (64%)</td>
</tr>
<tr>
<td>Mandible</td>
<td>150 (36%)</td>
</tr>
<tr>
<td>Total</td>
<td>429 (100%)</td>
</tr>
</tbody>
</table>

Table 5 - Distribution of implants placed by means of MM on the basis of their tooth groups

<table>
<thead>
<tr>
<th>Localization</th>
<th>Number of implants (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front</td>
<td>103 (24%)</td>
</tr>
<tr>
<td>Premolar</td>
<td>137 (32%)</td>
</tr>
<tr>
<td>Molar</td>
<td>189 (44%)</td>
</tr>
<tr>
<td>Total</td>
<td>429 (100%)</td>
</tr>
</tbody>
</table>
Figure 5 - Bone-cutting chisel tips are available in several sizes with depth-indicating lines, which show the depth of splitting during work. The division, similarly to implant drills, indicates depths of 6-8-10-12 mm on the operating instrument tips.

Figure 6 - Implant socket preparation, expansion series with depth-indicating lines. The thinnest piece in the set has a diameter of 1 mm (with a needle-like tip), then is the pieces with tips in increasing size (2 mm, 3 mm, 3.3 mm), similarly to the series of implant-bone sockets. The pieces of the expansion series prepare root-shaped implant sockets.

Figure 7 - Tooth-and tooth root-removing tips are made with different profiles. Among them there are straight, flat chisel-shaped ones, there are hollowed, round-surface ones, both wide and narrow.

Results and discussion

• Shaking of the whole skull is moderate compared to traditional mallet-osteotome. The force of extremely fast, 0.1 second blows shows up in the plastic shaping of the bone. Shaking of the skull by the blows is very little. This can be disturbing for patients, and, similarly to the noise of the drill, it may cause problems in very sensitive subjects. However, such problems can be mitigated by the application of a vacuum or other complementary cushion.

• There are no consequent headaches, dizziness or nausea. Following surgery, no dizziness, headaches or nausea (generally caused by the dislocation of the auditory ossicles) occurred in any of the 269 patients of the present study.

• In osteotomy, any deviation from the desired direction, due to differences of bone density, can be avoided more easily. A handpiece, operated by MM and held quite firmly, “deviates” and goes in a slant direction more rarely than a traditional chisel. At the same time, keeping direction and ensuring parallelism requires considerable attention and practice.

• Subjects can be operated by one hand with better visibility. The small handpiece is easy to hold and it is also comfortable. Shaping the bone with both a traditional drill and piezo or laser requires continuous cooling, which can significantly hinder vision. This is not
Figure 8a - A 61-year-old woman; removal of left lower teeth (5-6) by means of the MM. Loosening tooth 5 with an MM extraction tip

Figure 8b - Lifting out the loosened tooth with tweezers

Figure 8c - Thanks to the minimally invasive extraction of teeth by MM, the destruction of soft tissues and bone structures is minimal

Figure 8d - Immediate implantation; 3 implants (Straumann) were inserted into the sockets prepared by MM

Figure 8e - X-ray before tooth removal

Figure 8f - X-ray after implant insertion

Figure 9a - A 63-year old male patient who had lost his upper and lower sets of implants inserted 5 years before. X-ray images taken before operation

Figure 9b - Preparation of an implant socket by means of MM osteotome

Figure 9c - Implant insertion (Straumann)

Figure 9d - The 3 implants placed

Figure 9e - X-ray check-up of the inserted implants (21-24-25-26)
necessary with the MM, and the operator has a perfect view at any moment. It is also advantageous in that no spray mixed with saliva and flora of the oral cavity gets in the face, eyes and respiratory tract of the operating staff.

- Faster bone-healing due to living bone surfaces. Shaping the bone without a cooling fluid does not require washing or rinsing the bone and, as a result, no whitened and “washed out” bone or lifeless-looking bone surface is created. Following the application of MM, the bone is red and shows a far more viable color.

Based on both histological tests in experiments on animal models and practical experience, we can state that wound healing and ossification occur faster than with rotary instruments.

- At the preparation of implant sockets, the bone is parted and not drilled. The bone is pre-served without shaving and without any loss.

The preparation of an implant socket can be easily performed even in the case of an alveolar ridge as wide as 5-6 mm, because the bone is pushed apart and no bone is shaved off the bone mass, the amount of which is small, anyway. We open the bone apart and carry out horizontal or vertical expansion.

- With doubly-curved tips, any part of the oral cavity is accessible for osteotomy.

In the part of the oral cavity located closer to the pharynx, access to bone surface is easier with the curved tips of MM; it can be easily used in the position of the second molar as well.

- It is easy to prepare the implant socket even in case of a thin bone.

Unless the surface of the bone is not covered with an extremely hard cortical, beginning with a 1 mm wide osteotome, the preparation of the implant socket can be started with blows of appropriate

**Figure 10a** - Extraction of tooth 45 performed with MM. During the procedure, the chisel-shaped operating tip was gradually introduced between the root and the alveolar wall and at grade 2, step by step, the slit at the line of the root membrane was expanded by means of tiny blows. Tooth mobility is determined by applying it around the tooth, so that it can be lifted out without any decrease in the bone layer of the wall of the alveolus.

**Figure 10b** - Following tooth extraction, the narrow crest is split by means of MM, with the chisel-shaped tip.

**Figure 10c** - Following splitting of the jaw bone crest, the formation of the implant socket is carried out by a series of “root-form” MM tips, beginning with a 1 mm tip, continuing with 2 and 3 mm “root-form” tips.

**Figure 10d** - The insertion of the implants (3 3.2-10 SGS LA) (already in place) by means of MM between the split bone plates in the places of teeth 44-45-46.
Upper edentulous maxilla of a 64-year-old female patient after the removal of 8 implants placed 19 years before. A thin jaw-bone crest and minimal bone supply are available.

Figure 11b - Surgical plan: sinus lift on the right side, placement of 4 implants (3.75-10 and 3.75-12 SGS implants) by means of MM. Implant socket is prepared with MM using “root-form” tips of gradually increasing diameters.

Figure 11c - The inside of the bone socket created with MM was not rinsed, as no fluid-cooling was needed. The prepared bone surface provided the impression of a dense, “bloody” and living bone tissue. The depth of the implant socket on the lines of MM tips can be seen as well as on the lines indicating the depth of bone socket on rotary hammer drills. There is no bone loss at the preparation of the implant socket. The expanding tips simultaneously expand, condense and thicken the bone.

Figure 11d - Placement of self-cutting 3.75-10 SGS in the place of tooth 16. With a ratchet spanner, by continuous force and control, the implant can be driven into the bone socket prepared with MM.

Figure 11e - The 4 implants placed into the right maxilla without any bone loss. The expansion of the narrow mandibular crest was carried out with just a little bone supply by MM, without breaking or cleaving the edge of the bone.

Figure 11f - X-ray control after surgery. The 4 implants placed and the result of sinus lift can be seen.
Figure 12a - Persistent primary lower left central incisor (71) in a 38-year-old male, high risk subject. Underdeveloped alveolar ridge around the tooth. The alveolar ridge is concave, from the edge of the ridge towards the base of the mandible it gets narrower and narrower.

Figure 12b - After careful splitting, the preparation of the bone socket on the thin bone was carried out by means of MM. At the start bone width on the ridge was 4 mm

Figure 12c - Following careful and gradual expansion a 3.3 Straumann BL tapered SLActive implant was placed. The width of the ridge reached 7.3 mm

Figure 12d - Placement of the prosthetic crown on the implant

Figure 13a - Osteoporosis around the mesial root of the right lower tooth 7 in the panoramic X-ray image showing inflammation, which is the actual cause of the toothache complained by this patient. The distal root is knee-shaped

Figure 13b - Removal of ankylosed tooth 47 by MM. It was loosened with the chisel-shaped tip out of the bone socket, then the tooth was chopped up with a turbine, then we continued to move it and lift it out of the alveolus

Figure 13c - Spherically ossified ankylosed fragments at the tips of the removed roots. Because of this, their removal with traditional tools was not possible. With MM, their extraction from the bone nests was carried out without causing any nerve injury.
Figure 14a - Panoramic X-ray image of the situation before implant placement

Figure 14b - Bone-splitting by means of MM chisel tip

Figure 14c - Formation of implant sockets by means of MM in the place of tooth 44, first in the alveolar ridge split into 2, with the 1 mm tip expander

Figure 14d - The implant socket prepared in the place of tooth 44

Figure 14e - Starting implant socket expansion with a tip of 1 mm in the place of tooth 46

Figure 14f - Expansion of the implant socket with a 3 mm expander

Figure 14g - Application of a 3.3 mm expander tip. The depth of the socket can be seen on the lines of the expanding tip

Figure 14h - Placement of an implant (3.2 10 SGS) in the place of tooth 44

Figure 14i - Implant placement (3.2 10 SGS) into the place of tooth 46. Completion of the thin mandibular crest with titan net and synthetic bone.

Figure 14j - The 3 implants (SGS) in the right lower quadrant can be seen in the panoramic X-ray image, following bone splitting and implant placement
force. If the cortical is hard, the application of either a spherical drill or a piezo can be of help for passing through. Then, in the spongiosa we can pass forward with the MM osteotome.

- The implant, with its self-cutting edge, can be well screwed into the prepared implant socket. Bone-splitting can be carried out easily and precisely. The self-cutting implant of approximately the same size as the socket prepared with the tip of appropriate thickness of the MM, can be screwed in by the help of a ratchet spanner. It is normally reasonable to prepare a socket into the bone of a diameter smaller by 0.5-0.6 mm than the implant to be put in. This is influenced by bone density as well as shaping the surface of the implant.

At bone splitting, a similar procedure is followed. The cortical can be transected with an MM blade, a piezo or a drill, depending on hardness. In the spongiosa, we can pass forward with the MM tips. Reaching the appropriate depth is indicated by the lines on the MM tips, with divisions similar to those on the drills for the implant socket.

- Removal of roots and teeth can be carried out with special tips preserving the bone.

For the removal of teeth and roots, thin, smooth, bent and curved tips can be applied. Tips introduced with mechanical power are capable of separating the surface of the tooth from that of the bone.

- At bone condensation, widening and thickening take place at the same time. MM osteotome tips widen, condense and thicken the bone mass simultaneously. Thus there is the chance to preserve and maximally utilize the bone.

- There is no need to drill, there is no bone loss “shaving-free bone preparation”.

In the case of soft bone (D3 and D4), the bone socket can be formed exclusively by MM, there is no need to apply any rotary instruments. In some cases, it can be useful to carry out directional drilling with a 2 mm spiral drill, following which, keeping the appropriate direction, MM osteotomes of increasing diameters should be applied. In a considerable part of cases there is no bone loss at all and, in a lesser rate, there is minimal bone loss, which is just a small part of that compared to the bone loss made by traditional drills.

- There is no warming up experienced on drilling, no cooling fluid is needed. Thus, no physiological substances are washed out of the bone, which promote healing. “Living bone surfaces” are left. Physiologically important, bioactive substances, indispensable for osseointegration, remain in their place, and do not have to be artificially replaced. At the application of rotary instruments, piezo or laser,
the cooling fluid washes them out to a significant degree and thus, the viability of the bone and its inclination to heal decrease.

- No debris is created which hinders healing.
  Bone debris, lifeless mass can often hinder or slow down bone healing. At the application of MM no debris is produced.
- It is minimally invasive for the patient, pain can be avoided.
  The gentle therapeutic technique, good visibility and maximal bone preservation significantly contribute to a decrease in or lack of postoperative complaints. Implantation can often be carried out even without flap elevation.
- It works with precisely calibrated force, depth and period of time, works with extremely short impulses, so its application is gentle.
  Bone-shaping with MM is well predictable. Depth can be controlled continuously by the help of division lines on the tips. The short and gentle impulses...
effectively shape the bone. In the case of hard bone we can use the piezo technique, then we continue the operation with MM.

- Bone-splitting and sinus lift can be performed easily. Bone-splitting in soft, D3 and D4 bones is considerably simpler. In the case of hard bone it is worth doing bone-shaping in the first cortical level by piezo, then, in the spongiosa, we can advance further by MM. In the case of sinus lift there are several technical solutions at our disposal; calibrated force and work with blunt tips can involve many advantages.
- If necessary, it can be combined with other techniques and, in one phase of the intervention, we can use MM and in the other phase a different tool (thread-cutter, piezo, indicating bone drill, scalpel, laser and other instruments).

Conclusions

In bone-shaping and implantology the MM is an instrument that can be applied in a wide range of oral and implant surgical interventions.

In the case of risk patients and lesser bone mass, it is possible to prepare implant sockets by splitting and expanding the bone with minimal bone loss.

The use of MM for implants with favorable surface properties (e.g. Straumann SLActiv), increases the chance of success, even in high-risk cases.

It can be well combined with other surgical techniques (Figure 15, 16, 17, 18).

Its application allows bone preservation even at the removal of teeth and roots.

Based on our favorable experience lasted one and a
half year, the MM can be recommended for every-day practice, especially in implant socket preparation, removal of teeth and roots and bone-splitting. It is indispensable in the case of little bone mass and in high risk patients.

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