Practical Osseous Surgery in Periodontics and Implant Dentistry ................. 4
Clinical Success in Bone Surgery with Ultrasonic Devices .................. 4

The book presents osseous surgery in periodontal, implant and orthodontic treatments.

“Extraction, IntraLift® (sinus lift by the crestal approach) and the Piezocision™ techniques with Piezotome® ultrasonic surgical units are developed.”


“Technical aspects, indications and contraindications for bone surgery in periodontology and implant dentistry, devices and instrumentation, preoperative evaluation and premedication, intraoral and extraoral donor sites”.

“The piezoelectric surgery accordingly offers comfort, safety, and precision to the surgeon during delicate interventions.”

Key words
confocal laser scanning microscopy, environmental scanning electron microscopy, piezosurgery, ultrasonic osteotomy

Abstract
Objectives
The recently introduced ultrasonic osteotome procedure is an alternative to conventional methods of osteotomy. The aim of the present study was to establish the differences between five recently introduced ultrasonic osteotomes and to perform micromorphological and quantitative roughness analyses of osteotomized bone surfaces.

Materials and methods
Fresh, standard-sized bony samples were taken from a rabbit skull using the following ultrasonic osteotomes: the Piezosurgery® 3 with insert tip OT7, Piezosurgery® Medical with insert tip MT1-10, Piezon Master Surgery® with insert tip SL1, VarioSurg® with inert tip SG1, and Piezotome® 2 with insert tip BS1 II. The required duration of time for each osteotomy was recorded. The prepared surfaces were examined via light microscopy, environmental surface electron microscopy (ESEM), and confocal laser scanning microscopy (CLSM).
This article compares the osteotomy performed with 5 surgical piezoelectric devices. In that goal, the authors have performed micro-morphological and quantitative roughness analyses of osteotomized bone surfaces. All units presented bone micro-structure preservation. However, the power and the composition of the teeth of the insert tip might impact procedure duration and cutting qualities. A very quick performance was observed using Piezotome® 2 unit. The selective cut prevents all injuries to adjacent meninges.

Abstract
Key words
Gene expression, histology, microCT, Piezoelectric surgery, Piezotome.

Purpose
This pilot study evaluated the molecular, histologic, and radiographic healing of bone to instrumentation with piezoelectric or high speed rotary (R) devices over a 3-week healing period.

Material and Methods
Fourteen Sprague-Dawley rats (Charles River Laboratories International, Inc., Wilmington, MA, USA) underwent bilateral tibial osteotomies prepared in a randomized split-leg design using Piezotome® (P1) (Satelec® Acteon, Merignac, France), Piezotome® 2 (P2) (Satelec® Acteon), High-speed R instrumentation, or sham surgery (S). At 1 week, an osteogenesis array was used to evaluate differences in gene expression while quantitative analysis assessed percentage bone fill (PBF) and bone mineral density (BMD) in the defect, peripheral, and distant regions at 3 weeks. Qualitative histologic evaluation of healing osteotomies was also performed at 3 weeks.
Results
At 1 week, expression of 11 and 18 genes involved in bone healing was significantly (p < .05) lower following P1 and P2 instrumentation, respectively, relative to S whereas 16 and 4 genes were lower relative to R. No differences in PBF or BMD were detected between groups within the osteotomy defect. However, significant differences in PBF (p = .020) and BMD (p= .008) were noted along the peripheral region between P2 and R groups, being R the group with the lowest values. Histologically, smooth osteotomy margins were present following instrumentation using P1 or P2 relative to R.

Conclusions
Piezoelectric instrumentation favors preservation of bone adjacent to osteotomies while variations in gene expression suggest differences in healing rates due to surgical modality. Bone instrumented by piezoelectric surgery appears less detrimental to bone healing than high-speed R device.

With both Piezotome® piezoelectric surgical units, osteotomy margins were smooth and much better defined, suggesting minimal postoperative necrosis of the marginal bone during healing process.

Osteotomies performed with Piezotome® 2 went faster than Piezotome® 1. However, the increase of power of generation 2 has no effect on bone tissues or healing process.

No genetic, histologic, or radiographic evidence of necrosis or exuberant inflammation over the 3 week healing period was found.

Key words
Cutting performance, intraosseous temperature development, ultrasonic bone surgery.

Purpose
The purpose of this study was to investigate the increases in intraosseous temperature generated by a modern ultrasonic device for bone surgery (UDBS) and the influences of working pressure and cooling irrigation on this temperature.

Materials and Methods
Twenty human mandibular bone specimens (20 x 15 x 5 to 7 mm) were used; three vertical cuts were performed for a duration of 12 seconds per cut. Each bone specimen was machined with a different combination of working pressure (1.5, 2.0, 3.0, 4.0, or 6.0 N) and cooling irrigation (0, 30, 60, or 90 ml/min), and intraosseous temperatures were measured. Harmful temperature development was defined as an increase of more than 10°C for the 75th percentile and/or a maximum increase of more than 15°C. Cutting performance was also measured.

Results
Harmless intraosseous temperature development was identified for working pressures of 1.5 N and 2.0 N with cooling irrigations of 30, 60, and 90 ml/min and for 3.0 N at 90 ml/min. The maximum temperature observed was 72°C (6.0 N with 60 mL/min). The mean cutting performance values were 0.21± 0.02 mm/s for 6.0 N, 0.21 ± 0.06 mm/s for 3.0 N, 0.20 ± 0.01mm/s for 4.0 N, 0.11 ± 0.05 mm/s for 1.5 N, and 0.08 ± 0.03 mm/s for 2.0 N.

Conclusions
To prevent tissue damage in dental bone surgery, a minimum coolant amount of 30 mL/min is recommended. The working pressure should be chosen with great care because of its significant influence on intraosseous temperature. Doubling of the working pressure from 1.5 to 3.0 N requires a tripling of the coolant (30 to 90 mL/min) to prevent tissue damage. A working pressure above 3.0 N did not result in improved cutting performance.

To prevent damage in dental bone surgery when using an ultrasonic device, a minimum coolant amount of 30ml/min is recommended. A working pressure above 3Ncm may not enhance the cutting performance.

Key words
Cutting performance, intraosseous temperature development, material testing, ultrasonic bone surgery.

Purpose
The purpose of this study was to evaluate and to compare the bone-cutting performance and intraosseous temperature development of three modern ultrasonic devices for bone surgery (UDBS).

Materials and Methods
The following UDBS and associated cutting tips (straights bone saws) were used in this study: (1) Piezosurgery II professional, tip OT 7 (Mectron); (2) Piezotome, tip BS 1 (Acteon) and (3) Surgysonic, tip ES007 (American dental system/Günther Jerney). In the experimental setup UDBS, handpieces were immobilized, and bone specimens from the middiaphysis of a bovine femur were moved in a longitudinal direction under the cutting tip to a standardized depth of 3.0 mm. Statistical analysis was performed using the Wilcoxon rank sum test.

Results
The median increase (25th through 75th percentiles) of the local intraosseous temperature was 3.0°C (2.2°C to 4.2°C) for the SurgySonic, 2.2°C (1.8°C to 3.2°C) for the Piezosurgery II, 1.1°C (0.7°C to 1.6°C) for the Piezotome. The median cutting performance was 0.31 mm/s (0.11 to 0.46 mm/s) for the Piezotome, 0.25 mm/s (0.23 to 0.27 mm/s) for the Piezosurgery II and 0.04 mm/s (0.03 to 0.05 mm/s) for the SurgySonic.

Conclusions
Among the three tested UDBS, the Piezotome and the Piezosurgery II showed a significantly higher cutting performance than the SurgySonic. The Piezotome produced the smallest increase in intraosseous temperature.

Acteon® & Mectron® showed a significantly higher cutting performance, whereas Acteon produced the least increase of intraosseous temperature. Differences in the cutting performance and intraosseous temperature development of the tested devices seemed to be influenced by the design of the cutting tips of the bone saws used in this investigation. On Acteon device, was observed a deeper penetration into the bone. Its cutting tip showed more homogenous and sharper spike geometry and more roughened spike surfaces than other cutting tips.

Key words
Alveolar ridge augmentation; bone transplantation; complications; dental implants; maxillary sinus; ultrasonic therapy.

Background
The lateral window approach to maxillary sinus augmentation is a well-accepted treatment option in implant dentistry. The most frequent complication reported with traditional techniques has been the perforation of the Schneiderian membrane, with perforation rates ranging from 11% to 56%. The purpose of this retrospective, consecutive case series from two private practices was to report on the rate of Schneiderian membrane perforations and arterial lacerations when a piezoelectric surgical unit was used in conjunction with hand instrumentation to perform lateral window sinus elevations.

Methods
Clinical data (Schneiderian membrane perforation, Underwood septa, and laceration of the lateral arterial blood supply to the maxillary sinus) were obtained retrospectively from two private practices and pooled for analysis. The information was collated after an exhaustive chart review. Fifty-six consecutively treated lateral window sinus lifts were performed on 50 partially or completely edentate patients.

Results
Zero perforations of the Schneiderian membrane occurred during the piezoelectric preparation of the lateral antrostomies, whereas two perforations were noted during subsequent membrane elevations using hand instrumentation. In both instances, membrane perforations were associated with sinus septa. The overall sinus perforation rate was 3.6%. Arterial branches of the posterior superior alveolar artery were encountered in 35 cases, and there were zero instances of arterial laceration.
Conclusions
This retrospective case series from clinical private practices confirmed that a lateral window approach to sinus elevation incorporating piezoelectric technology in conjunction with hand instrumentation was an effective means to achieve sinus elevation while minimizing the potential for intraoperative complications. Further prospective and randomized controlled studies are warranted to qualify these observations.

“Piezotome®, SATELEC® ACTEON® unit was used to performed the 56 sinus lifts.

20 to 30% prevalence of Schneiderian membrane perforations was reported with the used of high-speed rotating instruments in the preparation of lateral sinus windows.

The bony thickness of lateral maxillary sinus walls averages 0.91mm, and the adjacent Schneiderian membrane averages 0.15mm in thickness, the traditional use of high-speed rotating instruments for the preparation of lateral sinus antrostomies requires exacting attention to detail.

Because piezoelectric surgery does not cut soft tissues, it stands to reason that proper piezoelectric use in the preparation of lateral sinus antrostomies would reduce the risk of Schneiderian membrane perforation.”


“The clinical case presented is of a 44 year-old Caucasian female patient. She consulted to replace a maxillary removable partial denture that she could no longer tolerate”.

“- Perform prompt minimally invasive interventions;
- To reduce the number of implants needed in oral reconstruction;
- To adapt the oral reconstruction to the requirements of the future prosthetic replacements.”

Introduction
Sinus lift procedures are a commonly accepted method of bone augmentation in the lateral maxilla with clinically good results. Nevertheless, the role of the Schneiderian membrane in the bone-reformation process is discussed controversially. Aim of this study was to prove the key role of the sinus membrane in bone reformation in vivo.

Material and Methods
14 patients were treated with the minimal invasive thUCSL-Intralift, and 2 ccm collagenous sponges were inserted subantrally and the calcification process followed up with CBCT scans 4 and 7 months after surgery.

Results
An even and circular centripetal calcification under the sinus membrane and the antral floor was detected 4 months after surgery covering 30% of the entire augmentation width/height/depth at each wall. The calcification process was completed in the entire augmentation volume after 7 months. A loss of approximately 13% of absolute augmentation height was detected between the 4th and 7th month.

Discussion
The results of this paper prove the key role of the sinus membrane as the main carrier of bone reformation after sinus lift procedures as multiple experimental studies suggested. Thus, the importance of minimal invasive and rupture-free sinus lift procedures is underlined and does not depend on the type of grafting material used.

All 14 thUCSL Intralift® Sinus lift procedures were conducted without perforation of the sinus membrane, and no postsurgical complications suspicious of sinus-membrane perforations occurred. It proves the key role of the sinus membrane as the main carrier of bone reformation after Sinus Lift procedures as multiple experimental studies suggested the importance of minimal invasive and rupture-free sinus lift procedures is underlined and does not depend on the type of grafting material used.

Objectives
To evaluate the rupture length of the sinus membrane after applying a defined 1.2 mm defect comparing 3 different techniques: Summers lift, balloon-assisted technique (BASL), and hydrodynamic ultrasonic cavitation sinus lift (HUCSL).

Study design
Thirty fresh sheep heads (60 maxillary sinuses) were investigated. The sinus membrane was ruptured using a 1.2 mm pilot drill. Then Summers lift, BASL, and HUCSL were each performed on 20 sinuses, creating a 5 mm vertical lift of the sinus membrane. The length of the ruptured sinus membrane was measured before and after the experiment. The results of the different sinus lift techniques were compared using t tests.

Results
The t test showed that the Summers lift leads to a significantly higher rupture length (P = .05) than BASL. The comparison between Summers lift and HUCSL showed a significantly higher rupture length with the Summers lift (P < .005). The same significance (P < .005) was found when BASL was compared with HUCSL. Comparing the increasing rupture length of the sinus membrane during the experiment, the t test showed a significantly greater rupture using BASL or the Summers lift compared with HUCSL.

Conclusions
The HUCSL technique yielded the lowest increase of rupture length compared with BASL and Summers lift. The technique therefore shows the lowest risk of a growing rupture of the sinus membrane in case of an iatrogenic puncture during preparation of the transcrestal approach.

The HUCSL (Intralift® - ACTEON® Piezotome® equipment), was designed to elevate the sinus membrane without any tearing forces using an ultrasonic oscillating water stream to lift up the sinus membrane from the bone. The Intralift technique showed the best results of the 3 investigated methods (Summers lift, BASL, HUCSL), and that it yielded the lower risk of an enlarged rupture of the sinus membrane in case of an iatrogenic puncture during preparation of the transcrestal approach. Compared with the litterature, which reports a need of covering only defects which are >2 mm, it can be concluded that Intralift® could decrease postoperative complications after augmentation, because the percentage of ruptures is low and their size does not extend the critical size of 2 mm.

Purpose
The aim of the present study was to evaluate the pressure forces appearing to elevate the sinus membrane by comparing the hydraulic and pneumatic pressure. Also, the relation between the time and volume of the applied liquid and the achieved lift-volume were determined.

Materials and Methods
A total of 190 fresh, half sheep heads were used for the present investigation. An ultrasound surgical device (Piezotome®; Acteon, Bordeaux, France) was tested to evaluate the pressure increase at different flow rates. The elevation volume at different flow rates and activation times of the ultrasound hand piece were measured.

Results
To detach the sinus membrane pneumatically from the sinus floor, a mean average pressure of 29.54 millibars was required. Using the hydraulic technique, a mean average pressure of 19.8 millibars was determined. Comparing the different flow rates, the elevated volume increased to 0.52 ml when a flow of 60 ml/minute was used. Using an activation time of 20 seconds, a lifted volume of 3.92 ml could be measured on average. If the flow was set to a maximum of 60 ml/minute, the created volume increased to 5.58 ml. A comparison using the $x^2$ test showed a significant correlation ($P = .03$) between the application time and the created sinus lift volume. Even at high flow rates of 60 ml/minute of the activated Piezotome for a 20 second period, no rupture of the sinus membrane of the sheep head occurred in 190 experiments.

Conclusion
From these results, we have concluded that hydrodynamic ultrasound could be used as an alternative method for sinus floor elevations of any size and volume with a mere 3-mm-diameter transcrestal approach, if findings from clinical investigations confirm the results of the present animal study.

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To detach the sinus membrane pneumatically (Balloon) around 29.54 millibars was required against 19.8 millibars for the hydraulic technique (IntraLift®) with an average lifted volume of 3.92ml. With Piezotome®, no rupture of the sinus membrane of sheep heads occurred.
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Abstract
The IntraLift is an alternative to conventional sinus grafting techniques with dramatically reduced trauma and high patient acceptance. The aim to minimize operation techniques was the drive for the authors to invent this protocol based on the piezoelectric and the microcavitation effect. Regarding the protocol, a traumatization of the Schneiderian membrane is extremely reduced, and even if there is a perforation, the protocol describes the plugging of a collagenous sponge to close the perforation and to continue with the operation protocol. Small areas like single tooth implants or huge edentulous areas can be grafted with an osteotomy from the crestal aspect and, if no lateral augmentation is necessary, only with the atraumatic punch technique. Patients today desire more and more a minimalization of operation techniques combined with a high predictability. This technique is an opportunity to increase the number of patients with compromised maxillary bone situation. New trabecular bone formation was partially visible only after 6 weeks, and in 98%, the treated patients didn’t use any analgetics. Hence, an enlarged database and additional studies are necessary to underline the effectiveness of this technique.

"The IntraLift® is an alternative to conventional sinus grafting techniques with dramatically reduced trauma and high patient acceptance. New trabecular bone formation was partially visible only after 6 weeks, and in 98%, the treated patients didn’t use any analgetics."

Abstract
Vertical alveolar crest splitting and horizontal distraction of narrow alveolar crests is limited when rotating and low frequency oscillating tools are used due to large amounts of procedural bone loss and poor handling provisions. Aim of this study was to determine the safest osteotomy depth and to develop ultrasonic-surgery-tips to enable flapless vertical crest splitting and distraction of narrow alveolar crests of 2 mm or less. The safest osteotomy depth was determined on a cow-rib-model. To enable a flapless crest splitting and widening procedure, prototype-tips for the Piezotome-device were developed and tested against mechanical tools (widening screws and distractors) on cow-ribs, as well as their safe use in the hands of novice-surgeons on human cadaver heads. A minimum vertical osteotomy depth of 7-8 mm revealed the least fracture rates (3%). The use of the ultrasonic distraction tools showed the least risk of procedural failures (2%). Twenty-three Piezotome-trainees performed the procedure with the developed tips on fresh full human cadaver skulls with a success rate of 100%. The results of this study suggest that, with the use of ultrasonic surgical devices, the indication for vertical crest-splitting can be narrowed down to a crest width of 2 mm and even less and that it can be performed flapless, thus leaving the physiological bone-periosteum system fully intact.

"The results of this study suggest that, with the use of ultrasonic surgical device Piezotome® 2, the indication for vertical crest-splitting can be narrowed down to a crest width of 2 mm and even less and that it can be performed flapless, thus leaving the physiological bone-periosteum system fully intact."

Key words
Alveolar ridge augmentation, bone regeneration, grafting, bone, mandible, partially edentulous jaw.

Methods
Thirteen patients with 17 horizontal alveolar ridge deficiencies of the posterior mandible were treated with the piezoelectric hinge-assisted ridge split procedure. After an average healing period of 14 weeks, dental implants were placed into the augmented sites. Intrasurgical alveolar ridge measurements taken at the initial surgery and subsequently at the time of implant placement documented the horizontal gains achieved by this procedure.

Results
Overall mean gain in horizontal width was 4.03 mm (± 0.67). For single implant-site augmentations, the mean gain was 3.38 mm (± 0.25). For multiple adjacent implant-site augmentations, mean gain was 4.25 mm (± 0.62). A total of 31 dental implants were successfully placed in all sites and none required additional augmentation procedures. There were no instances of adverse outcomes, such as neurosensory deficits or sequestration of mobilized buccal plates. After a minimum of 6 months of loading, all dental implants have been successful.

Conclusions
This retrospective observational report demonstrates that the piezoelectric hinge-assisted ridge split procedure can achieve substantial gains in horizontal ridge width of the edentulous posterior mandible without associated morbidity. Further prospective and larger observational studies are warranted to see if this is true over a larger patient population and to compare this technique to other more traditionally used approaches.

All patients healed uneventfully with no instances of infection, sequestration of the mobilized buccal plate, or neurosensory deficits. Overall mean gains in horizontal width were 4.03 mm (± 0.67). Anecdotal observations made of the ridge split surgical sites included regenerated bone being well vascularized and that bone density was consistently Type II and occasionally Type I bone.

Abstract
In today’s fast-paced, esthetic-conscious society, the orthodontic treatment of the adult patient can sometimes be a challenge. Considerable time spent in treatment as well as the use of brackets often deter patients from seeking treatment. The authors illustrate how Piezocision™ combined with Invisalign® can be used in selected cases to successfully treat adults who would otherwise not pursue orthodontic treatment.

This case report illustrates how Piezocision™ (with BS1, Piezotome®, SATELEC®, ACTEON®, FRANCE) combined with Invisalign can be used in selected instances to satisfy the needs of esthetic-and time-conscious adult patient. This novel technique can be combined with different orthodontic treatment modalities to satisfy today’s adult patient population.

Abstract

An increasing number of adult patients are seeking orthodontic treatment to enhance their smile or their masticatory function. In this fast-paced and self-conscious society, time and esthetics have become increasingly important. One of the biggest challenges an adult orthodontic patient faces is the time spent wearing brackets. Over the years, several surgical techniques have been developed to address this issue and reduce overall treatment time. Although very effective, these techniques have proven to be quite invasive. A new, minimally invasive procedure (Piezocision™) is presented that combines microincisions and localized piezoelectric surgery to achieve similar results rapidly and with minimal trauma.

"The successful and rapid treatment of two patients with angle Class II malocclusions is presented through use of Piezocision™ (with BS1, Piezotome®, SATELEC®, ACTEON®, FRANCE) minimally invasive procedure. This technique combines microincisions with selective tunneling that allows for hard and soft tissue grafting and piezoelectric incisions. This combination of buccal interproximal microincisions and localized piezoelectric corticotomies is able to create a significant amount of demineralization around teeth in the areas of tooth movement, making this a very attractive alternative to conventional and more aggressive techniques. The procedure strengthens the patient’s periodontium while cutting down treatment times drastically (ideal for adult patients with time limitations)."

**Abstract**

An increasing number of adult patients have been seeking orthodontic treatment, and a short treatment time has been a recurring request. To meet their expectations, a number of surgical techniques have been developed to accelerate orthodontic tooth movement. However, these have been found to be quite invasive, leading to low acceptance in patients and the dental community. The authors are introducing a new, minimally invasive procedure, combining microincisions with selective tunneling that allows for hard or soft tissue grafting and piezoelectric incisions. This novel approach is leading to short orthodontic treatment time, minimal discomfort, and great patient acceptance, as well as enhanced, or stronger, periodontium. Because of the added grafting (bone and/or soft tissue), the periodontium is much thicker buccally.

*Because of its micrometric and selective cut, the piezoelectric knife is said to lead to safe and precise osteotomies without any osteonecrosis damage. The technique being proposed here demonstrated similar clinical outcome when compared with the classic decortication approach but has the added advantages of being quick (decreased chair time), minimally invasive, and less traumatic to the patient. It takes typically 1 hour to complete both arches vs 3 to 4 hours. This technique is quite versatile because it allows for soft-tissue grafting at the time of surgery to correct mucogingival defects if needed, as well as bone grafting in selected areas by using localized tunneling.*

Key-words
Selective alveolar decortication, Rapid treatment, Osteopenia, Corticotomy-assisted orthodontics.

Abstract
Following selective alveolar decortication as defined by the surgical scarring of the alveolar cortex, severe malocclusions can be orthodontically treated in six months. When combined with bone grafting, this technique also significantly expands the scope of treatment in resolving extreme dental arch crowding or borderline skeletal problems with stable clinical outcomes. The biology of rapid tooth movement after selective alveolar decortication involves a transient decrease in bone density thus creating a local environment of less resistance. Animal studies verify demineralization-remineralization (osteopenia) as the rationale for rapid orthodontics and it is surmised that the stability of orthodontic outcome is due to increased tissue turnover and increased cortical bone thickness due to the graft. With careful treatment planning and understanding of the biological rationale, the alveolar bone metabolism can be locally manipulated to achieve stable and rapid orthodontic results.

The healing response to the cortical bone injury can be exploited and manipulated clinically by moving teeth at the healing site. Doing so perpetuates the osteopenia (decreased bone density but not bone volume) and the augmentation grafting increases alveolar volume. Orthodontic treatment outcomes are more stable because of the high tissue turnover after surgery and the increased cortical bone thickness because of the grafting. The scope of tooth movement is at least doubles in most spatial dimensions if orthodontics is combined with decortication and grafting and treatment times are 3X to 4X times more rapid.
Immediate extraction placement and loading in the aesthetic zone, J. Kleiber, Implant Dentistry Today, January 2013.

Aims and objectives
The aim of this article is to demonstrate an approach for immediate implantation following atraumatic extraction in the aesthetic zone.

The reader will:
- Learn the three key factors for immediate placement and provisionalisation
- See the protocol for achieving them
- Understand the role of piezosurgery in aiding atraumatic extraction.

The piezosurgery unit used here was the Piezotome® 2 (SATELEC®, ACTEON®), with the specifically designed extraction tips. This unit has certain advantages over others as it has a fibre optic light that allows clear vision of the periodontal ligament space and surrounding tissues. It also has an extremely wide range of power settings that allows it to adapt to the clinical situation by providing gentle luxation, or a more vigorous manipulation quickly and easily.

Key words
Piezosurgery; Piezotome; Third molar surgery; PoSSe scale.

Abstract
Our aim was to compare the use of a conventional rotary handpiece and a Piezosurgical unit for extraction of lower third molars. We studied 40 patients, who were allocated alternately to have the third molar removed with either the handpiece or the Piezosurgical unit. Pain, trismus, and oedema were evaluated at baseline and then postoperatively, together with paraesthesiae, on postoperative days 1, 3, 5, 7, and 15. Damage to surrounding tissue was checked on the same day whereas dry socket was evaluated from postoperative day 3 onwards. More patients complained of pain in the conventional group, they also required more analgesics, and they developed trismus more often than in the piezosurgery group. There was also significantly more postoperative swelling in the conventional group. Patients were also evaluated using the subjective Postoperative Symptom Severity (PoSSe) scale. Our results suggest that apart from some inherent limitations with the Piezotome, it is a valuable alternative for extraction of third molars.

When we compared the overall outcome in the two groups, we found significantly less pain, trismus, and facial swelling and a better perception of the quality of life by the patients after third molar extraction using the Piezotome® (SATELEC®, ACTEON®).

Keywords
Ultrasonic Surgery; Piezotome; Rotating Instruments; Post Surgical Swelling; Post Surgical Pain; Impacted Mandibular Third Molars; Osteotomy

Abstract
Aim of the study was to evaluate if there is a constant and significant reduction in traumaticity when massively traumatic oral surgical procedures such as the removal of third molars are conducted with only ultrasonic surgical devices (Piezotomes) expressed in a reduction of postsurgical pain and swelling on the patient’s side since such clinical experiences by the authors suggested this. Since oral surgeons criticize a higher time consumption for surgeries with Piezotomes also the objective time consumption was evaluated and compared to the traditional methods.

Material and Methods
56 female and male patients were selected that already underwent a removal of an impacted third mandibular molar on one side with rotary instruments by bone destructive burring with a still persisting comparable third mandibular molar on the contralateral side complaining about recurrent pain episodes and were already documented for pain and swelling before. The ultrasonic surgical removal with the Piezotome was conducted with a buccal osteotomy of the compacta lateral to the impacted third molar, preservation of the resected compacta in saline solution, removal of the third molar by single or multiple dentotomy and full anatomical restitution of the surgical site with the preserved buccal compacta. The swelling was documented by kephalometry 24/48/72 hours and 1 week post surgery, the pain index by the total consumption of ibuprofen-400 mg—tablets. Lesions of the mandible nerve were documented. Netto surgery time was taken from the first incision to the last suture of the procedure.
Results
6 patients had to be excluded from evaluation due to incomplete post surgical follow up. A significant (***, p > 0.999) decrease in pain and swelling of 50% was detected both for the parameters swelling and pain with Piezotome-surgery. No lesions of the mandible nerve were detected with Piezotome surgery whereas surgery with rotary instruments resulted in 16% hypesthesia at least up to one week. Although netto surgery time was approximately 50% longer when done with the Piezotome at the beginning the time consumption normalized with the growing experience of the surgeons back to the time schedule when surgery was performed with rotary instruments revealing no significant differences (-, p < 0.73)

Conclusions
The results of this retrospective study suggest that Piezotome-surgery is superior in atraumaticity and soft-tissue safety compared to traditional procedures with burs and grants the patients significantly less post surgical pain and swelling. Although, as it is with all new surgical tools and protocols, surgery time is longer at the beginning when purely working with ultrasonic surgical devices time consumption reduces to normal values after a learning curve.

Piezotome®-surgery is superior in atraumaticity and soft-tissue safety compared to traditional procedures with burs and grants the patients significantly less post surgical pain and swelling. No lesions of the mandible nerve were detected with Piezotome surgery whereas surgery with rotary instruments resulted in 16% hypesthesia at least up to one week. Ultrasonic surgical devices time consumption reduces to normal values after a learning curve showing no significant time difference to procedures with rotary instruments.