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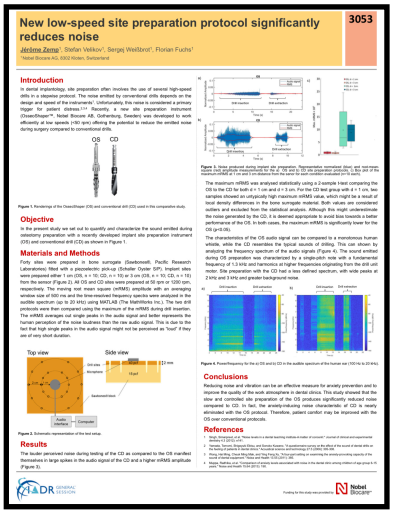
Is the sound of drilling distressing for your patients?

Our biomechanics lab compares the noise of a conventional drill vs the OsseoShaper™ instrument: part of the #NobelBiocareN1 system site preparation protocol.

Operating at a low speed and without irrigation, it minimizes noise and vibration and is considerate of patient comfort.

Take a look at a study comparing these instruments: https://bit.ly/3b9lPYB

#nobelbiocare #dentalimplants #implantdentistry #OsseoShaper #biomechanics



Gerald Niznick DMD, MSD • You
Dental Implant Pioneer

Nobel's mantra at the end of this video is "WE FOLLOW NO ONE". This is not accurate when you consider that I invented the internal hex connection with a lead-in bevel in 1986 (Screw-Vent - patent issued 1990) and NobelBiocare launched the NobelActive in 2008, waiting 17 years for my conical connection patent expired. Now Nobel's claim of "innovation" is to run a drill at 50rpm to reduce the noise compared to running at 1200rmp. It claims that the N1 Shaper drill is the monumental design innovation that allows bone cutting at slow speeds, going right to the final sizing of the osteotomy. Of course, one could run the spade drill at 50 rpm if noise were the most important factor in reducing patient stress. Real patient (and doctor) stress occurs when the implant fails to osseointegrate and we know for a fact that in soft bone, insertion of a tapered implant into an undersized socket generates higher initial stability by compressing the bone. This is important to achieve consistent osseointegration and absolutely critical for immediate loading. As shown in the comparison picture the spade drill is only end-cutting compared to the side-cutting Shaper dill. It is obvious which drill is more likely to result in an oversized socket in freehand preparation.

New low-speed site preparation protocol significantly reduces noise

3053

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Introduction

In dental implantology, site preparation often involves the use of several high-speed drills in a stepwise protocol. The noise emitted by conventional drills depends on the design and speed of the instruments[1]. Unfortunately, this noise is considered a primary trigger for patient distress.[2,3,4] Recently, a new site preparation instrument (OsseoShaper™, Nobel Biocare AB, Gothenburg, Sweden) was developed to work efficiently at low speeds (<50 rpm) offering the potential to reduce the emitted noise during surgery compared to conventional drills.

Figure 1. Renderings of the OsseoShaper (OS) and conventional drill (CD) used in this comparative study.

Objective

In the present study we set out to quantify and characterize the sound emitted during osteotomy preparation with a recently developed implant site preparation instrument (OS) and conventional drill (CD) as shown in Figure 1.

Materials and Methods

Forty sites were prepared in bone surrogate (Sawbones®, Pacific Research Laboratories) fitted with a piezoelectric pick-up (Schaller Oyster S/P). Implant sites were prepared either 1 cm (OS, n = 10; CD, n = 10) or 3 cm (OS, n = 10; CD, n = 10) from the sensor (Figure 2). All OS and CD sites were prepared at 50 rpm or 1200 rpm, respectively. The moving root mean square (mRMS) amplitude with an averaging window size of 500 ms and the time-resolved frequency spectra were analyzed in the audible spectrum (up to 20 kHz) using MATLAB (The MathWorks Inc.). The two drill protocols were then compared using the maximum of the mRMS during drill insertion. The mRMS averages out single peaks in the audio signal and better represents the human perception of the noise loudness than the raw audio signal. This is due to the fact that high single peaks in the audio signal might not be perceived as “loud” if they are of very short duration.

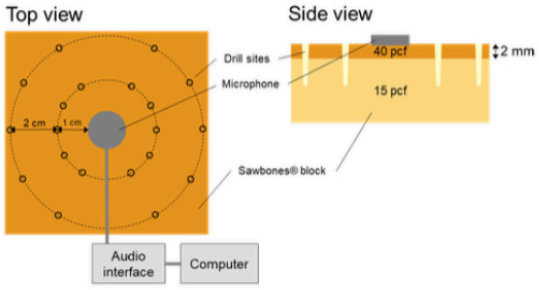

Figure 2. Schematic representation of the test setup.

Results

The louder perceived noise during testing of the CD as compared to the OS manifest themselves in large spikes in the audio signal of the CD and a higher mRMS amplitude (Figure 3).

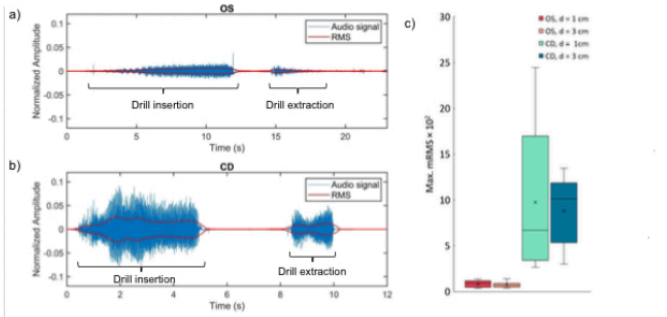

Figure 3. Noise produced during implant site preparation. Representative normalized (blue) and root-mean-square (red) amplitude measurements for the a) OS and b) CD site preparation protocols. c) Box plot of the maximum mRMS at 1 cm and 3 cm distance from the senor for each condition evaluated (n=10 each).

The maximum mRMS was analysed statistically using a 2-sample t-test comparing the OS to the CD for both d = 1 cm and d = 3 cm. For the CD test group with d = 1 cm, two samples showed an untypically high maximum mRMS value, which might be a result of local density differences in the bone surrogate material. Both values are considered outliers and excluded from the statistical analysis. Although this might underestimate the noise generated by the CD, it is deemed appropriate to avoid bias towards a better performance of the OS. In both cases, the maximum mRMS is significantly lower for the OS ($p<0.05$).

The characteristics of the OS audio signal can be compared to a monotonous human whistle, while the CD resembles the typical sounds of drilling. This can shown by analyzing the frequency spectrum of the audio signals (Figure 4). The sound emitted during OS preparation was characterized by a single-pitch note with a fundamental frequency of 1.3 kHz and harmonics at higher frequencies originating from the drill unit motor. Site preparation with the CD had a less defined spectrum, with wide peaks at 2 kHz and 3 kHz and greater background noise.

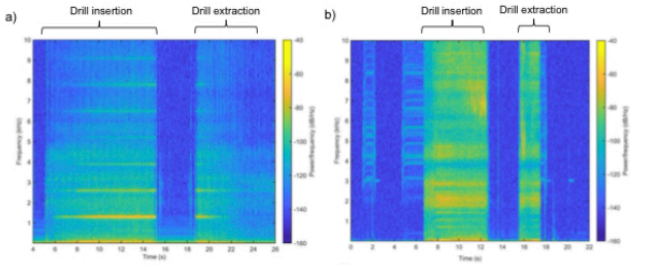

Figure 4. Power/frequency for the a) OS and b) CD in the audible spectrum of the human ear (100 Hz to 20 kHz).

Conclusions

Reducing noise and vibration can be an effective measure for anxiety prevention and to improve the quality of the work atmosphere in dental clinics. This study showed that the slow and controlled site preparation of the OS produces significantly reduced noise compared to CD. In fact, the anxiety-inducing noise characteristic of CD is nearly eliminated with the OS protocol. Therefore, patient comfort may be improved with the OS over conventional protocols.

References

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Funding for this study was provided by Nobel Biocare™