Surgeon heart rate analysis during the dental implant procedure

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Abstract
Dental implant placement is a singular procedure in dentistry, and many variables should influence its success. The operator’s attitudes during surgeries are some of these variables. Considering that, the present paper aims to evaluate surgeon’s stress during different stages of dental implant placement. The heart rates of ten post-graduate students of implantology were evaluated at rest and during various steps of the implant placement procedure, using a Polar R device. Each surgeon’s heart rate was monitored at different moments (preparation of the surgery; anaesthesia; incising and flapping procedures; bone perforating; implant placement at bone site; suture; end of the surgical procedure) during a single surgical implant insertion procedure (without additional procedures such as expansion, grafting and others). Implantodontic interventions were found to be the most stressful of these procedures, and implant placement in the bone site the most critical. Current procedures for the general practitioner, such as local anaesthesia, induced minor variations in the heart rate and, hence, less stress.

Key Words:
dental implants, heart rate, stress
Introduction
One of the fastest and most effective ways of evaluating a person’s physical fitness during effort is to evaluate the individual’s heart rate\(^1\). During dental implant placement, changes in the surgeon’s emotional stress and physical effort are noticeable. These changes in the level of stress and physical effort are related to alterations in the heart rate\(^2\). General surgeons have been found to undergo alterations in their heart rate during their work\(^3\) and the professional experience of ophthalmic surgeons significantly influences their heart rate changes during surgical procedures\(^4\). However, the literature lacks reports on this type of investigation to evaluate changes in the heart rate of dental surgeons during implant placement. This paper evaluates alterations of the surgeon’s heart rate during implant placement in different steps of the procedure.

Material and Methods

Subjects
Ten post-graduate students of implantology from the University of Taubaté volunteered as subjects of this research, which was approved by the ethical committee of the University of Taubaté (Protocol number 411/04). The subjects have the approximately the same level of training in implant procedures.

Methodology
The surgeon’s heart rate was evaluated at rest and during various steps of the implant placement procedure, using a Polar R device (Sony, Finland) equipped with a transmitter held against the surgeon’s chest by a band. This transmitter sends heart rate data to a monitor overseen by a researcher. This device is used in gyms and physical fitness centers, by people undergoing physical rehabilitation, and also in scientific investigations\(^5\).

Each surgeon’s heart rate was monitored at different moments during a single surgical implant insertion procedure (without additional procedures such as expansion, grafting and others), as shown below:

- T1- Preparation of the surgery;
- T2- Anaesthesia;
- T3- Incising and flapping procedures;
- T4- Bone perforating;
- T5- Implant placement at bone site;
- T6- Suture;
- T7- End of the surgical procedure.

Results and Discussion
Alterations in the level of stress and physical effort are related to the heart rate\(^2\). Implant placement is an event that causes a considerably high level of stress as well as physical effort in some steps. Graph 1 shows the average heart rate of each surgeon during different surgical steps. Three of the surgeons showed higher than average heart rates. Seven surgeons experienced the same average heart rate. It should be due to differences on physical conditions and/or age and other factors related to general health. Since the individual heart condition is not the subject of our study, but the heart rate related to procedures, it was not considered to be discussed.

A significant increase in the heart rate was found to occur during incising and flapping (T3), but this increase was even greater during the implant placement at the bone site (T5). The highest average heart rates occurred during steps T3 to T5, which are exclusive of implant placement surgery. The most noticeable decrease in heart rates occurred during anaesthesia (T2). Graph 2 highlights these data. The upper and lower lines indicate the boundaries of the interval within which the majority of heart rates were recorded (the interval, which is equal to the average plus (for upper line)/minus (for lower line) the standard deviation). The steps in which the average line exceeded the upper limit are significantly more stressful (T5), while the steps in which the average line dropped below the lower limit are significantly less stressful (T2).

Upon completion of the surgical procedure (T7), the heart rate was found to be higher than at other moments of the surgical procedure as a result of the physical effort required to organize material and instruments.

During dental implant placement (without additional procedures such as expansion, grafting and others), a significant rise in the average heart rate occurred during implant placement at the bone site (T5). This moment requires minimal physical effort, and the main cause of heart rate alterations is the stress involved in this surgical procedure. Placement of the implant at the bone site is the moment when the immediate success of the surgical intervention is revealed. If the basic implant requirements fail to be met, the prognosis for osseointegration is doubtful. Upon conclusion of the implant insertion, the surgeon must check the good
adjustment of the implant in the bone, its proper insertion in the osseointegrating zone inside the bone, the quality and quantity of remaining bone around the implant (which will provide nutrition), and the implant’s inclination and position in relation to other implants and/or adjacent and antagonist teeth. When implant is located adjacent to important anatomical sites, the insertion procedure is even more stressful. During implant placement at the bone site, asepsis of the procedure must also be ensured. The surgeon must avoid any possible contamination of the implant by saliva, contaminated instruments and even other types of metal that should not touch the implant. It is during placement of the implant in the bone site that the surgeon ascertains if everything that depends on him has been carried out correctly to ensure the success of the surgical procedure. The correct performance of all the other procedures during and prior to the actual surgery (such as planning) will ensure an acceptable and successful implant. The implant placement at the bone site is not the most important step of the surgical procedure, but it is the moment that will confirm whether or not the preceding steps were carried out correctly.

Bone perforating (T4) also led to a significant increase in the heart rate, since it involves specifically implantodontics surgery, and many of the factors discussed in the above paragraph also influence this step. One of the major concerns in this step is the inclination and positioning of the surgical site, and the control of heat generated by drilling during bone perforation.

Another step that caused a considerable increase in the average heart rate was the incising and flapping procedure (T3). This surgical procedure involves placing pressure on the instrument used. This pressure must be both intense and precise in order to avoid injuring the mucosal flap. Therefore, the increased heart rate during incising and flapping is probably caused by both physical effort and mental stress.

During anaesthesia (T2) the average heart rate of most of the surgeons was found to slow down. Local anaesthesia is used for most invasive procedures at dental clinics. Therefore, dentists are very familiar with and adept at applying anaesthesia. This fact, allied with the absence of major physical effort, contributes to reduce the level of stress in this procedure, although anaesthesia is also not devoid of risks.

This highlights the relevance of technique control. The procedures related exclusively to implant presented higher stress levels. The subjects of this study were postgraduate students considered junior surgeons, so their lack of familiarity with these surgical procedures must be taken into account. However, since the aim of this study was to evaluate the surgical procedure itself rather than the surgeon, the results reported here are relevant.

Finally, the importance of the surgeon’s well-being during implant surgery must be emphasized. Although we were unable to find reports in the literature on this subject, concern for the surgeon’s well-being has been evinced in other areas, such as medicine and industry. Therefore, every resource that can serve to minimize the stress level, such as minimizing the surgeon’s physical effort during implant placement, is justifiable.

It can be concluded that, during implant placement, the most significant increase in the surgeon’s heart rate occurred during implant placement at the bone site, while the greatest slowdown in the heart rate occurred during anaesthesia.

References