

## PLATELET-RICH PLASMA - AN ACCELERATOR OF THE SECONDARY STABILITY OF IMMEDIATE LOADED IMPLANTS.

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### ABSTRACT

**Aim:** To represent the results of one-year research on an original protocol for immediate functional loading of intraosseal implants.

**Patients and Methods:** Totally 86 implants were placed on 21 patients- 7 male and 14 female patients at age of 26 to 64 years. 44 of the implants were treated with PRP. The implants were inserted in bone type D2 by Misch, class A. Endure implants with diameter 4.3 have been used in the study. Implant stability was evaluated by Resonance-Frequency analysis.

**Results:** The dynamic changes in the implant stability after the immediate loading have demonstrated improved stability of PRP-treated implants compared with the implants from control group.

**Conclusion:** The established by us protocol for immediate functional loading of intraosseal implants has demonstrated higher success rate compared to the already known protocols and could be recommended for clinical use.

### PATIENTS AND METHODS

A total of 21 patients participated in the study-7 male and 14 female at age from 26 to 64 years. 86 implants were inserted and immediately loaded. 44 of them were treated with PRP. In the rest of the implants PRP was not used, but all other conditions listed below were the same as with the PRP treated implants. The implants were inserted in bone type D2, class A (by Misch<sup>20</sup>).

Implants used in the study were Endure (IMTEC Corp., Ardmore, OK, USA) 4,3x11mm.

These implants offer excellent primary stability due to their double tapered shape- an anatomical design with taper at the apical region and another at the crestal module.

After patient's evaluation and usual preparation for

implant surgery a PRP is obtained by patient's own blood. Venous blood is drawn out in sterile containers (S-Monovette –Sarstedt, Germany), containing 1 ml CPDA-1. The PRP separation is made in centrifuge. The PRP separation is done in centrifuge. The first spin is at 2400 rpm for 10 minutes. With this spin we separate the erythrocytes from platelet poor plasma. With the second spin at 3600 rpm for 15 minutes we separate the PRP from platelet poor plasma. The whole PRP separation procedure is performed under aseptic conditions.

The osteotomy and insertion protocol for Endure implants are very simplified, which shortens the duration of the procedure, saves time and minimizes the errors done by the clinician during the procedure. In the immediate functional protocol we use flapless procedure which will preserve the crestal bone blood supply. We begin with removal of mucosa which covers the osteotomy site by tissue punch (Tissue punch – IMTEC Corp. Ardmore, OK, USA). The drilling procedures are done under irrigation with sterile 0.9% saline solution. We drill the pilot hole by a pilot drill with a diameter of 1.6mm. The pilot drill is externally irrigated. All other drills which will follow are with double- external and internal irrigation. The osteotomy continues with sequence of drills with increasing diameter- 2.0mm; 3.5mm and 4.3 mm. The osteotomy was performed at 900 rpm.

Then the PRP is activated by 10% solution of CaCl<sub>2</sub>. We treat the implants with this solution by simply dipping them in the solution, avoiding any contact with the walls of the container in which the PRP was kept and the treatment was done. The implant is placed in the osteotomy hole by holding it by the cap of the container in which was provided sterile by the producer –. The final seating of the implant is done by a torque wrench. The torque wrench (Adjustable torque wrench-

IMTEC Corp. Ardmore OK, USA), allows adjusting of the torque from 15 to 70 Ncm. It is used with Endure hexagonal adaptor. The minimal required torque, which should be reached, is 50 Ncm. The primary stability of the implants reached 50 or more Ncm of torque is evaluated by Resonance-frequency analysis (RFA). On the implants which could not satisfy the requirement for the minimal torque of 50 is placed a cover screw and their loading is delayed with 3 or more months.

The second requirement for immediate loading is to reach at least 60 ISQ values with the resonance frequency analysis (RFA). The measurement of the stability by RFA is performed by Osstell Mentor (Integration diagnostics-Gothenburg, Sweden) and the result is displayed in ISQ (Implant Stability Quotient) values.

On the implants, which satisfy these requirements are placed the abutments. In our cases we used one-piece, non-hexed shouldered abutments (Simplified shouldered abutment-SSA, Imtec Corp., Ardmore, OK, USA). The angle between the longitudinal axis of the abutment and the abutment walls is 6 degrees, which spares the necessity of abutment preparation in most of the cases. If the abutments have to be shortened, they are marked and the preparation is performed after they are removed from the implant to avoid the heating up the implant, compromising of the primary stability by the vibration. If there are remains of resin or cement in the periimplant gap, they are thoroughly removed.

The PRP gel, which is already formed, is applied into the periimplant gap.

Over the abutments are placed prefabricated temporary crowns. We should use at least two or more splinted implants as co abutments. After the adjustment and removal the tight occlusal contacts the crowns are relined with nonacrylic resin (Lexatite, Imtec Corp, Ardmore, OK, USA) and cemented by temporary cement.

On every two weeks, a visit for RFA measurement of the implant stability is scheduled. If the registered ISQ value is below 50 ISQ, the implant is unloaded, by replacing the abutment with a cover screw.

## RESULTS AND DISCUSSION

The stability of the implants was evaluated on every two weeks for totally 12 weeks.

The implants which were treated with PRP maintain their stability over 50 ISQ, demonstrating 100% of success rate. Three of the implants, which were not treated with PRP in the 6-th week demonstrated stability below 50 ISQ. These implants have to be unloaded and the procedure for their immediate loading failed. The success rate of the immediate loading protocol with non PRP treated implants is 92.85%. Despite that 5 months after their insertion they demonstrated good osteointegration. The success rate of the control group is similar to the results published by Colomina et al.<sup>21</sup>, Olsson et al.<sup>22</sup> and Naert, et al<sup>23</sup>.

Eleven of totally 86 were placed immediately after tooth extraction and immediately loaded. The requirement for such implants was that the dimensions of the post extraction socket to be with smaller size than the osteotomy. This will ensure that the whole implant surface will be supported by a "new" bone, without any remainings of the walls of the post extraction socket. The implants, which met these requirements has the same success rate as implants with delayed placement. The anatomical shape of Endure implants is appropriate for immediate placement, as it fits to the shape of the post extraction socket in most of the cases and closes its orifice.

## CONCLUSIONS

- The application of PRP with the described protocol is associated with improved stability of immediate loaded implants in the period between second and sixth week of their loading.
- The protocol described by us improves the success rate of immediate loaded implants.
- The RFA method should be used as a prevention of implant failure, by dynamic evaluation of implant stability.

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