Cisplatin chemotherapy impairs peri-implant bone repair

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Abstract

Were used 84 male rats (Wistar),divided into two groups, Cisplatin (CIS) and saline solution (SS). The titanium implants (DSP Biomedical® - 2.2 mm x 4 mm) were placed on the surgical alveoli prepared using a 2mm cutter attached to a surgical motor at 45N torque and 980 rpm speed under constant irrigation. Group SS: Received sodium chloride 0.9% via intraperitoneal at 15 and 17 days, postoperatively. Group CIS: Received 5mg/kg and 2.5mg/kg of cisplatin via intraperitoneal, at 15 and 17 days, postoperatively and respectively. The animals were euthanized at 22, 30 and 60 days postoperatively. 24 undecalcified specimens were prepared for histometric analysis of bone/implant contact (BIC). The 60 remaining specimens were selected to: bone area (BA) measurement, histological analysis of preset parameters and scores using the sections stained with Hematoxylin and Eosin (HE) and immunohistochemical analysis of RUNX-2, osteocalcin (OCN) and tartrate resistant acid-phosphatase (TRAP). The surface of BIC between the newly formed bone and the implant was lower in CIS, when compared to SS at the same periods. The area of newly formed bone within the implant threads was lower in CIS, when compared to SS at the same periods. In the histological analysis, the groups SS and CIS showed a similar structural pattern of the peri-implant bone at 30 days, strictly. However, the inflammatory response was persistent and exacerbated on the animals treated with cisplatin. The immunohistochemical analysis showed the animals in the SS group had progressive decrease in the number of RUNX-2 positive cells over the experimental periods, didn’t observed in CIS, in which the number of immunoreactive cells increased from 22d to 60d. There was a higher number of OCN-positive cells in SS at all time periods. Was observed a higher number of TRAP-positive cells in CIS when compared to SS at the same time points, indicating an increased resorptive activity in the animals submitted to chemotherapy.

Background and Aim

The clinical success of intraosseous implants consists on the extension of direct contact between bone and implant. Some conditions can interfere the obtention of osseointegration, such as surface treatment, implant diameter and bone quality at the receiving area. Moreover, unfavorable systemic conditions as diabetes, osteoporosis, cyclosporine immunosuppression, corticoids, tobacco and currently, the treatment of cancer also interfere the osseointegration of these implants. Over past years, the use of intraosseous implants in cancer patients who underwent surgical resection of the tumor and oncological treatment has increased, although, with absence of accurate information concerning the behavior of bone at peri-implant areas. The purpose of this study in animals is to evaluate the peri-implant bone repair against the systemic administration of cisplatin.

Methods and Materials

- 84 male animals *Rattus norvegicus albinus* (Wistar)
- Implants DSP Biomedical® (4mm x 2,2mm)
- Medication protocol with Cisplatin (5mg/kg and 2,5mg/km, respectively) and Sodium chloride 0.9%.

FIGURE 1: EXPERIMENTAL DESIGN

FIGURE 2: SURGICAL INTERVENTION

Representative images of the implants placement on their right tibiae. (A) 30mm incision; (B) cortical exposure and drilling; (C) Implants placement; (D) implants platform at bone level.

Results

FIGURE 3: BIC

FIGURE 4: NEWLY-FORMED BONE

FIGURE 5: RUNX-2

FIGURE 6: OCN

FIGURE 7: TRAP

Conclusions

Within the limits of the present study, it is possible to conclude that the chemotherapeutic cisplatin negatively affects the bone repair at peri-implant areas, impairing the osseointegration of titanium implants.

References

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