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Case Report

Recombinant Human Growth Hormone in Immediate Implant in the Anterior Region: A Case Report

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Abstract

This article aims to present a case report that highlights the use of recombinant human growth hormone (rhGH) in bone formation and maintenance in immediate implants. Female patient, 44 years old, leucoderma, good general health. The tooth 21 had dental mobility. Computed tomography, hypodense image was observed not apex of the tooth and maladaptation of the intraradicular nucleus. The planning for the case consisted of dental extraction and implant placement, incorporating Somatropin 1.33 mg, 1UI before its non-surgical alveolar insertion. After two months of the surgical procedure, a new tomography was requested to evaluate the contact of the bone tissue and implant. At 6 and 12 months postoperatively, good implant stability was observed with favorable conditions of function. The 12-month postoperative tomography examination showed appropriate bone formation throughout the implant. According to the literature and the clinical case, the use of rhGH demonstrates to be able to increase the quality and the speed of the healing. As well as the coadjuvant in osseointegration.

Keywords: *Growth Hormone; Anterior Region; Immediate Implant; Growth Factors*

Abbreviations

GH: Growth Hormone; GFs: Growth Factors; RhGh: Recombinant Human Growth Hormone; rhBMP-2: Recombinant Human Bone Morphogenetic Protein-2; rhPDGF-BB: Recombinant Human Growth Factor Derived from Platelets; IGF-I e II: Insulin-like Growth Factors; PLGA: Poly Lactic-Co-Glycolic Acid

Introduction

Despite the recent advances in regenerative medicine, the reconstruction of maxillofacial defects continues to be a challenge. These challenges result from the set of criteria that need to be met for successful replacement by restoring, maintaining and improving tissue function [1]. This field has focused on the investigation of biomolecules to induce local bone formation. The most promising factors for the increase include recombinant human bone morphogenetic protein-2 (rhBMP-2) and recombinant human platelet-derived growth factor (rhPDGF-BB) [2]. Among the growth factors include growth hormone (GH), also called somatotropic hormone or somatotropin. GH is secreted by the anterior pituitary gland, promoting growth. It is synthesized and stored by the adenohypophysis, more precisely by the somatotropic cells [3]. GH is a fundamental regulator of postnatal bone growth, acting on bone remodeling, which is regulated by the balance between bone reabsorption and formation [4,5]. In this process, GH plays a key role in affecting osteoclasts and, more markedly,

on osteoblasts, creating the theoretical basis for its possible anabolism effect on the skeleton. It plays an important role in postnatal longitudinal bone growth due to its ability to stimulate precursor cells in the epiphyseal cartilage. These effects are mediated either directly through GH receptors in the cell membrane or indirectly through increased synthesis of insulin-like growth factors (IGF-I and II) [4-9]. In medical treatment rhGH is responsible for increasing bone mineral density. A decrease in fracture risk is predicted because of improved bone density. In addition, a replacement of rhGH is associated with an increase in quality of life and physical activity, which could further reduce fracture rates [10]. In dentistry rhGH has been used topically to accelerate the osseointegration process by stimulating osteogenesis and therefore should accelerate the process of bone remodeling and maturation around implants. In addition, a particularly interesting possibility is the application of rhGH at the time of insertion of dental implants, improving the initial conditions of the receptor tissue for the implants and the predictability of implant treatment [11]. There is a current tendency to use growth factors (GFs), with this, this work aims to present a case report highlighting the use of growth hormone in immediate implants in the anterior region.

Case Report

The study was approved by the Research Ethics Committee of the Pontifical Catholic University of Rio Grande do Sul, PUCRS (Porto Alegre) n. 8373. A 44-year-old female patient, leukoderma, good general health, was attended at the Oral and Maxillofacial Surgery and Traumatology service of the Pontifical Catholic University of Rio Grande do Sul (PUCRS). The clinical examination revealed tooth mobility 21. Computed tomography was used, in which a hypodense image was observed at the apex of the tooth and the maladaptation of the intraradicular nucleus (Figure1). The planning for the case consisted of dental extraction and immediate placement of implants incorporating Somatropin growth factor 1.33 mg, 1UI (Ref.1.0089.0350, Saizen®, Aubonne, Switzerland) prior to its insertion into the surgical socket. To perform the surgical procedure for the use of infiltrative anesthesia with 4% of articaine and 1: 100,000 of epinephrine. Syndesomotomy was performed with a Molt detacher. Then, the tooth was moved with a straight lever nº301 to maintain the wall of the buccal bone. The tooth was then removed with diploma nº1 with cuffing to remove the periapical lesion and abundant irrigation of the alveolus (Figure 2A-2C). The preparation of the surgical socket with rotation of 800rpm and constant irrigation was followed. RhGH (Somatropin 1.33mg, 1UI, Ref.1.0089.0350, Saizen®, Aubonne, Switzerland) was incorporated into the socket on all its walls rhGH (Figure 3). Before implantation, a small amount of the hormone was added at its apex, for the purpose of scattering the entire surface at the time of insertion (Figure 4). The implant was SW Strong Cone Morse (Ref. SWCM3513, SIN® - São Paulo, SP, Brazil) with a diameter of 3.5 by 13 mm in length with a torque of 35 N.cm, measured with a torque wrench (Ref. TMECC, SIN® - São Paulo, SP, Brazil). During the surgical procedure a provisional prosthesis was made to restore the immediate esthetics (Figure 5). After two months of the surgical procedure, a new tomography was requested to evaluate the contact of bone tissue and implant (Figure 6). Three months after extraction and implantation, the definitive prosthesis was started. At 12 months post-operative good implant stability was observed with favorable function conditions. Radiographic and tomographic exams of the 12-month postoperative period showed adequate bone formation around the entire implant (Figure 7).

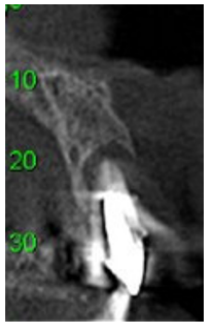

Figure 1: *Parasagittal cut showing hypodense image at the apex of the tooth and maladaptation of the intraradicular nucleus.*

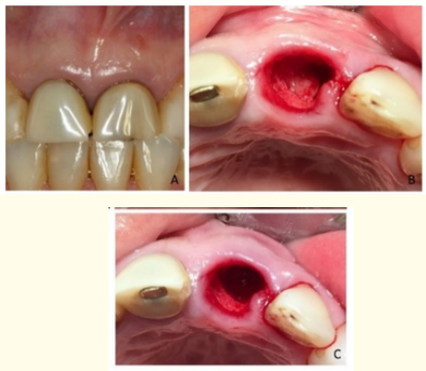

Figure 2: *(A) Initial tooth image 21; (B) image of the periapical lesion after removal of the tooth; (C) socket after removal of the periapical lesion.*

Figure 3: *Incorporating rhGH into the socket.*

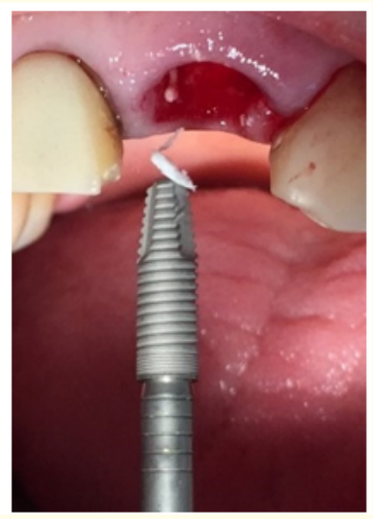

Figure 4: *RhGH at the apex of the implant.*

Figure 5: *Provisional ready-made.*

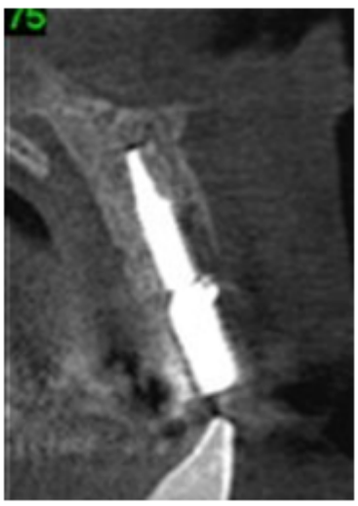

Figure 6: *Post-operative period of 2 months.*

Figure 7: *Post-operative period of 12 months.*

Discussion

Delay in healing can lead to damage in the final repair [12]. The growth factors are involved in the proliferation of undifferentiated mesenchymal cells, in the differentiation and morphogenesis of tissues and organs, being important for the healing and bone remodeling during the time of repair [13]. Thus, the search for alternative biomaterials with the purpose of stimulating the formation of tissue is justified. Studies bring the use of rhGH as one of the growth factors [3,14]. According to Gerzson., *et al.* [15], a biomaterial that functions as a scaffold (osteoconductor), combined with a growth factor (osteoinducer) would be of great interest for clinical application. For Gerzson., *et al.* Garcia., *et al.* [5,15] biodegradable polymers used for slow release of drug demonstrate satisfactory results. These authors also emphasized that PLGA is a good material for the preparation of matrices with rhGH and showed pronounced cell adhesion and proliferation. Another biomaterial used with the same principle is calcium phosphate which according to Guicheux., *et al.* the use of this component appeared to be effective for local delivery of rhGH, resulting in better bone replacement [16]. These biomaterials incorporated into growth hormone may serve as a scaffold for better bone response, maxillary sinus lift, alveolar preservation, gaps fillings, and bone defects in the buccomaxillofacial region [17]. A new method was developed to protect rhGh in polylactic-co-glycolic acid (PLGA) microspheres using an aqueous phase emulsion and by solvent evaporation [4,5], this technique together with a biomaterial can serve as a scaffold for filling the gap as in the clinical case presented in this study. In addition to the use in bone regeneration, rhGH may be an alternative for insertion into the immediate post-extraction socket and on the surface of titanium implants. According to Kobayashi., *et al.* [18] and Abduljabbar., *et al.* [19], the topical use of rhGh in animal socket improved the healing of bone around the implants. This technique has already been performed in humans according to the Zanettini., *et al.* [17] where absorbable collagen sponge and patient blood were used in the post-extraction socket to maintain RhGH at the surgical site. In this study the objective was to evaluate histomorphologically whether topical use of rhGh improves bone healing. After 28 and 56 days, the rabbits were sacrificed, and their tibia were sectioned. The slides were prepared and histo morphologically evaluated. Histological results showed that topical use of rhGH improved bone healing around implants in the groups receiving rhGH [18]. Eldein., *et al.* [8] in 2011, histologically evaluated the effect of rhGH use around immediate dental implants in the fresh sockets. Bone formation occurred in both groups. However, in the study group, bone density had more dense and well-oriented collagen fibers. An increase in bone response with high local administration of rhGH was observed. In the early stages of bone repair, osteons were more organized by the 12th week.

Conclusion

In conclusion, the use of rhGH powder around dental implants placed immediately in fresh sockets increased peri-implant bone response [20]. In the same line of research, authors advocated the use of rhGH on the surface of titanium implants, as in the Abreu study., *et al.* [3], in which they investigated whether rhGH would induce osseointegration and determined that their topical use induced bone neoformation in the early stages of healing. In addition to inducing bone formation in the early stages, this work aimed at maintaining the same after 12 months, as shown in figure 7. According to the available literature and the exposed clinical case, the use of rhGH demonstrates to be able to increase the quality and the speed of the bone healing around immediate implants acting as a coadjuvant in osseointegration.

Acknowledgements

None.

Conflict of Interest

The author declares no conflict of interest.

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