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'Biological restoration': total crown anterior

CASE REPORT

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Abstract – Restorative odontology is in constant evolution and is constantly seeking more aesthetic solutions to attend to demands from patients in search of the perfect smile. The case study presented herein refers to the aesthetic and functional recuperation of dental element 21, through the use of a dental fragment obtained through an extracted tooth, a technique known as 'Biological Restoration'. The results obtained, which were highly satisfactory, lead one to conclude that this technique can be considered as an alternative to all others and can be carried out successfully, quickly, and inexpensively.

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A study carried out in Belo Horizonte, Brazil, on the incidence of dental traumas revealed that nearly 79% of children between the ages of 9 and 14 have already suffered some form of dental injury. In addition, the most commonly affected tooth was the maxillary central incisor, which presented a prevalence of 8.1 in 1000 children examined, a study which confirms other previously found indices (1, 2).

In patients with prior dental fractures, cases of low self-esteem, discomfort and sensibility to cold are common. The quick restoration of the aesthetic appearance and the resolution of the discomfort produce emotionally and socially positive responses (3, 4).

There are innumerous clinical options for the treatment of dental fractures. The reattachment of the fragment, be it autogenous or homogeneous, represents a good option to this type of treatment as it is a simple and inexpensive method which allows for the maintenance of the incisal function, provides an aesthetically favourable and more durable result, maintains the colour and shape of the tooth, reproduces the details of the dental surface, and thus reestablishes the chewing function (3, 5–16).

However, in some situations, the fragment is not found or is damaged to the extent that its autogenous bonding becomes inappropriate, thereby pointing towards the possible use of fragments obtained by means of extracted teeth, a technique called homogeneous bonding or 'Biological Restoration', a term coined in 1998 (8), which has presented a number of satisfactory results (5, 9, 11, 17, 18). To perform such a procedure, the use of a Bank of Human Teeth becomes necessary (5, 9, 11, 12, 14, 19–22).

The present work is aimed at demonstrating, through a clinical case, the practicality, quality, and functionality, as well as the advantages and disadvantages, of homogeneous bonding of dental fragments (Biological Restoration), for the aesthetic and functional recuperation of fractured or extensively damaged anterior teeth.

Case report

The clinical case presented herein refers to a young patient who was admitted to the Dental Clinic at the Dental School of Universidade Federal dos Vale do Jequitinhonha e Mucuri in Diamantina, Brazil, complaining of a fracture of the clinical crown of dental element 21, for which the possibility of aesthetic and functional recuperation through homogeneous bonding of the dental fragment – 'Biological Restoration' – was considered as the patient did not have the original tooth fragment itself (Fig. 1).

The patient and her guardian were consulted regarding the intention of performing such a type of treatment and clarified as to the restorative procedures related to the homogeneous bonding of the dental fragment and its aesthetic and functional characteristics, such as: the return of the natural shape, colour, translucency, surface smoothness and lustre (15, 17). In addition, the results normally respond appropriately to the aesthetic and functional standards, considering that these restorations, when duly developed and later

Fig. 1. Initial clinical aspect.

adjusted, can present a variety of restorative properties using dental materials.

Later the patient was also informed about the best hygienic technique and diet for the preservation of the case and a Free and Clear Written Consent Form was duly signed by the patient's guardian.

The technique consisted of four phases: three clinical and one laboratory. In the first session, endodontic treatment was performed. In the second intervention, two-thirds of the length of the obturation material from the root canal was unblocked using braces of a diameter similar to the pre-manufactured glass fibre pin (Fibre-Kor® Pos System; Pentron Clinical Technologies, Wallingford, UK), which was cemented to this (C&B CEMENT, BISCO, USA). A filling nucleus made up of a photopolymerized composite resin (Filtek™ Z250; 3M ESPE, Sumaré, SP, Brazil) was crated. The preparation, on the nucleus, for the total crown with a chanfered cervical end necessarily made of enamel was carried out (Figs 2 and 3a,b). Having concluded the preparation, the moulding of the upper and lower arches with condensation silicone (PRINTER, Vigodent, Rio de Janeiro, Brazil) was performed. In this same session, the provisionary restoration was also made (Figs 3c,d).

For the development of the laboratory phase, the models were set up in a semi-adjustable articulator. A single die in special type IV plaster was also made to serve as a guide during outlining and cervical adaptation.

A donated extracted tooth, obtained at the surgical clinic of the same institution, presenting the approximate colour, form and dimensions of the previously prepared remaining tooth was then selected and autoclaved at a temperature of 121°C, for 15 min (22) (Fig. 4). The extracted teeth can also be acquired from a Bank of Human Teeth.

The appropriation phase proved to be the most burdensome, consisting of the cut and wear and tear of the dental element extracted to obtain a fragment presenting approximately the same preparation shape, which was carried out with the use of diamond burs under intense cooling (Fig. 5). To perform this technique, there are factors which should be treated with greater care, such as the constant hydration of the fragment, even after its outlining, to avoid being broken, which could in turn block the continuity of the technique.

During the testing of the fragment, it could be observed that the fragment appeared to be slightly darker than the adjacent teeth (Fig. 6). It was then submitted to an *in vitro* whitening process, using a 10% carbamide peroxide gel (WHITENESS STANDARD 10%; FGM, Joinvile, Brazil) for 10 h daily over a 5-day period.

In the following session, the fragment was better adapted to the die, in which the small existing fissures in the cervical region were filled with a photoactivated composite resin, thus allowing for a satisfactory attachment of the fragment (Fig. 7). The occlusion was adjusted to the articulated models in such a way as to facilitate the clinical phase procedures.

Later, the following steps were taken: (i) testing of the already whitened fragment in the remaining tooth; (ii) adaptation of the operatory field through relative isolation due to the impracticality of absolute isolation; (iii) appropriation of the remaining tooth and the dental fragment through the conditioning of its surfaces using a 37% phosphoric acid solution; (iv) application of the primer and adhesive (ADPER SINGLE BOND 2; 3M ESPE, CA, USA); and (v) the reattachment itself (Fig. 8), for which a chemically activated resin cement was used (C&B™ CEMENT, Schaumburg, IL, USA).

Aimed at improving the aesthetics, a photoactivated resin was added to the distal face. Some disadvantages of this technique point to the conjunction line between the fragment and the remaining tooth, thus pointing to the fact that, if visible, it could produce an effect which would prove to be unpleasant and inharmonious to the smile, a factor which is reversible through the performance of a bevel at the cementation line and the aesthetic recuperation by means of the insertion of the composite resin (13) or even by proportioning a greater cement thickness, thus increasing the chance of its degradation, which will consequently favour marginal microinflitration.

After the removal of the relative isolation, the final occlusal contacts were checked and adjusted where necessary (Fig. 9). As adjustments to the restoration using composite resin were deemed necessary, a new session was scheduled for the patient to clean the restoration.

In this special case, as the patient was a teenager and his/her canines had not yet undergone complete eruption, follow up was deemed necessary, considering the fact that it would be best if this disocclusion were to occur through the canine guide, even if this was actually induced by the increase in composite resin at the tips of

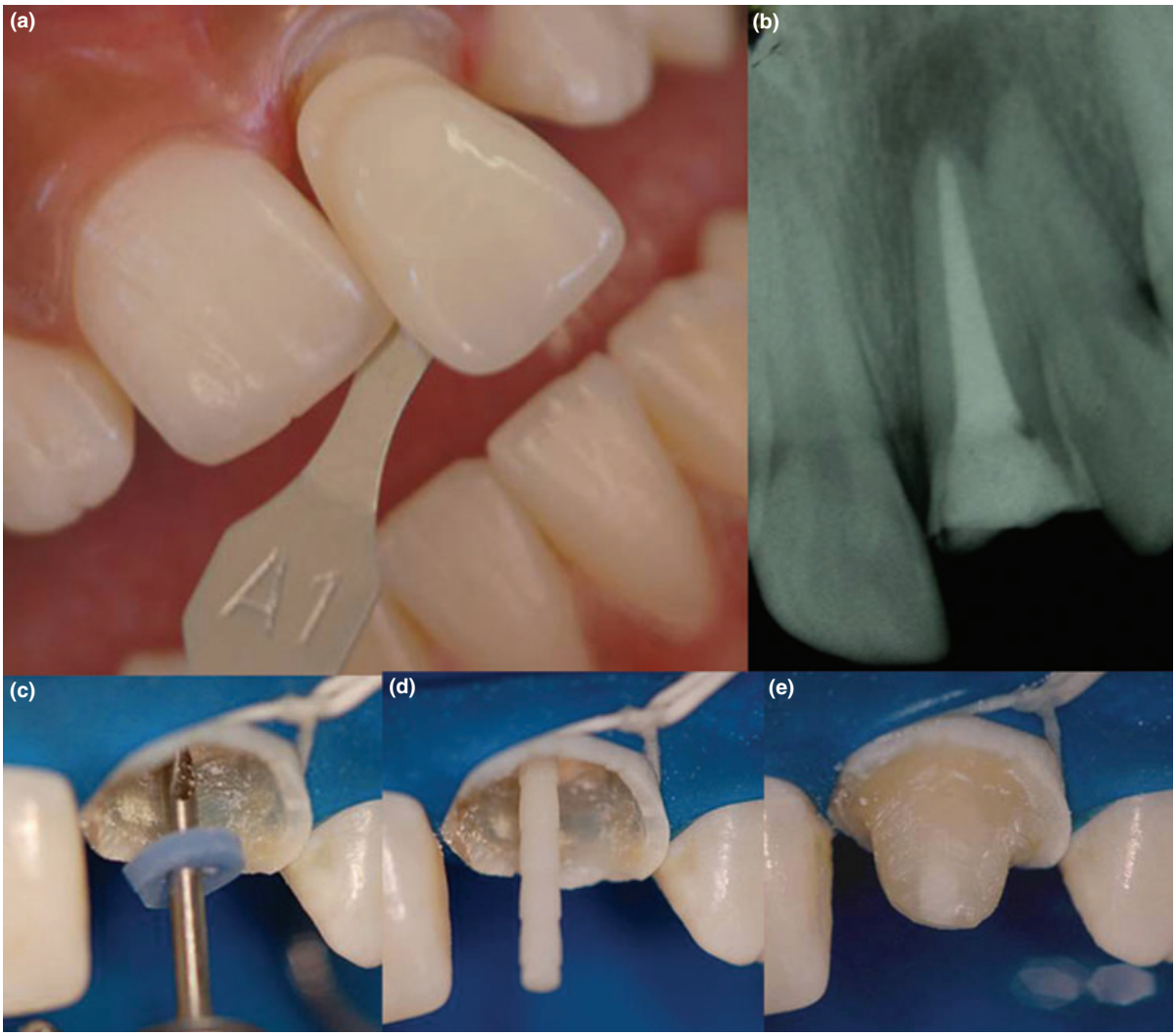

Fig. 2. (a) Choice of colour (adjacent teeth presenting colour A1). (b) Radiographic aspect after endodontic treatment. (c) Absolute isolation and unblocking of the root canal. (d) Placing of an aesthetic inter-radicular pin. (e) Aspect of preparation for the total crown created after the morphological reconstruction of the remaining tooth using a composite resin.

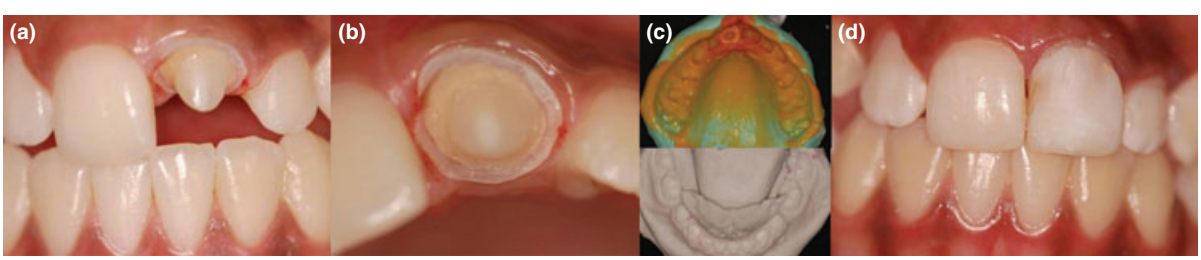

Fig. 3. (a) Aspect of preparation for the total crown. (b) Cervical end in enamel. (c) Moulds of the arches for set up in semi-adjustable articulator. (d) Clinical aspect after creation of provisionary restoration.

these dental elements so as to assure protection at the moment of lateral disocclusion and thus avoid occlusal maladjustments or fractures on the restoration.

Consequently, as for any other restoration, periodic proservation to assure a greater longevity is recommended. In Fig. 10, the clinical and radiographic control after a year can be observed.

The aesthetic need has been taking on ever-increasingly significant proportions, which can be seen in patient demands to reconstruct anterior and posterior teeth using aesthetic materials. Undoubtedly, restorative odontological materials have reached a high level of development and stability, but none of these, in their entirety, fulfils requirements which re-establish, plastically, aesthetically

Fig. 4. Aspect of the selected extracted dental element 21, presenting approximate colour, shape and size of the remaining tooth.

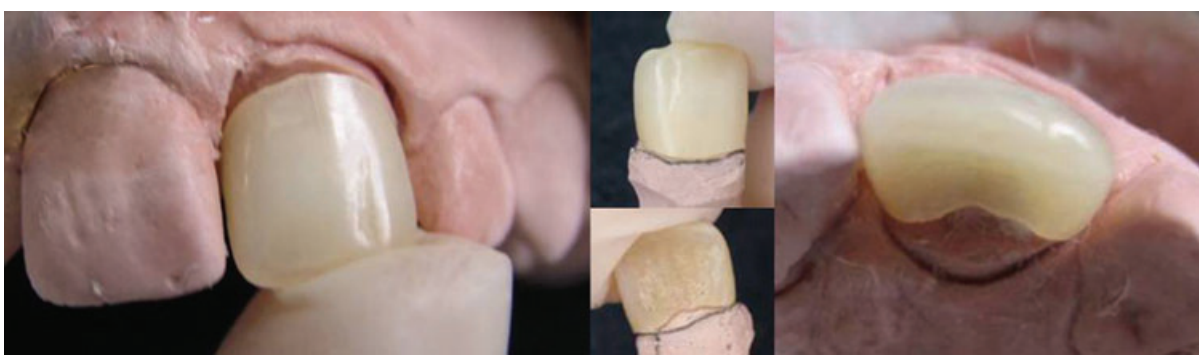

Fig. 5. Dental fragment after having been outlined and adapted to model.

Fig. 6. Clinical aspect of the dental fragment, presenting a slightly more yellow coloration and cervical dis-adaptation, when positioned in the previously prepared remaining tooth.

and functionally, the dental structure loss to the extent that it can be considered a complete substitute (20, 21, 23). Therefore, the advantages of this technique, regarding conventional prosthetic restorations, consist in the ability to return, in addition to functional properties, aesthetic properties related to the form, colour, translucidity, surface smoothness and texture, lustre, and natural wear and tear to the compromised dental element, especially as no odontological material can entirely substitute lost dental tissue. On the other hand, no disadvantages in the technique of 'Biological Restorations' and without limitations could be observed, considering that the main technique is that related to its application to anterior teeth as well as to the difficulty in acquiring extracted incisors and healthy canines, considering that tooth extraction in this region normally occurs due to periodontal problems and does not regularly occur in routine procedures at dental clinics.

Fig. 7. Appropriation of the dental fragment with a composite resin, in the cervical region, to improve its adaptation to the die and consequently to the remaining tooth.

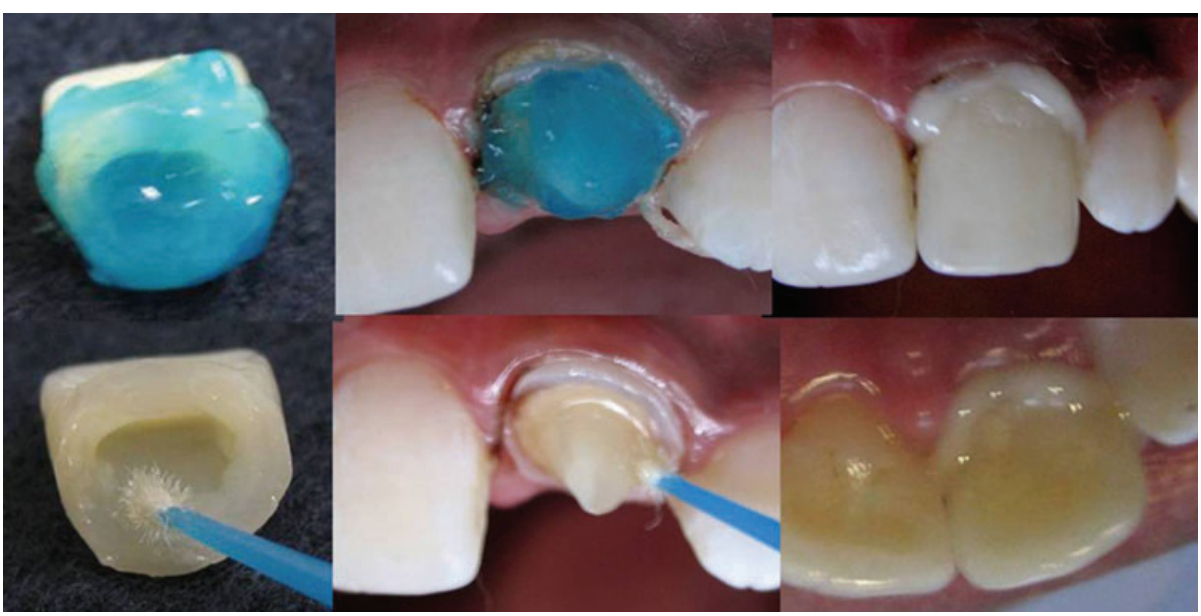

Fig. 8. Appropriation of the remaining tooth and dental fragment and the performance of the reattachment procedures using adhesive techniques, for which a dual polymerized resin cement was used.

The ideal situation would be to acquire extracted teeth from *tooth banks*, which are non-profit institutions geared towards the collection, cleaning, storage and distribution of teeth for didactic and scientific aims.

Another limitation can be found in the acceptance by patients to receive a tooth from another person, which can be combated by clarifying the techniques of sterilization applied.

The 'Biological Restorations', both autogenous and homogeneous, which have fulfilled such requirements and have returned to the patient the pleasurable sensation of once again having a healthy tooth, should be

Fig. 9. Final clinical and radiographic aspects after adjustment of the occlusion and polishing.

Fig. 10. Control clinical and radiographic aspect after 1 year.

considered as alternatives to the reconstruction of extensively damaged teeth, bearing in mind that such a procedure should not be seen as a substitute to existing restorative techniques, but rather, as yet another option which is feasible whenever the clinical situation allows for such measures.

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