

Case Report

Management of horizontal crown fracture caused by traumatic injury with endorestitution treatment

Nanik Zubaidah

Department of Conservative Dentistry
Faculty of Dentistry, Airlangga University
Surabaya - Indonesia

ABSTRACT

Background: Traumatic injuries of teeth are the main cause of emergency treatment in dental practice. The horizontal crown fracture more frequently observed usually occurs in maxillary anterior region and young male patients. The most common type of coronal fracture is in the middle third, followed by root and apical part. **Purpose:** The aim of this case report is to present the management of crown fracture of teeth with pulp exposure caused by dental trauma with endorestitution treatment in order to reconstruct the shape and the function of the teeth. **Case:** A 22 years old male with horizontal crown fracture of anterior teeth. The patient asked for aesthetic dental treatment both for its form and function. **Case management:** This horizontal crown fracture of anterior teeth with pulp exposure caused by dental trauma still could be reconstructed, mainly by endorestitution treatment. The endodontic treatment with post and core insertion in the root canal then would increase its retention. Later, the porcelain crown would aesthetically recover its original form and function, therefore, it would improve the patient's confidence and teeth function. **Conclusion:** Endorestitution treatment on anterior teeth with horizontal crown fractures and pulp exposure is able to recover the normal function, aesthetic, and self-confidence.

Key words: Dental trauma, horizontal crown fracture, endorestitution treatment

ABSTRAK

Latar belakang: Trauma pada gigi merupakan penyebab utama perawatan darurat dalam praktek dokter gigi. Fraktur mahkota horizontal pada umumnya terjadi pada gigi anterior rahang atas dan terjadi pada penderita pria muda. Jenis yang paling sering dari fraktur mahkota adalah pada sepertiga tengah, daerah akar dan apical. **Tujuan:** Laporan kasus ini menjelaskan penatalaksanaan fraktur mahkota gigi dengan pulpa terbuka akibat trauma dengan perawatan endorestorasi untuk mengembalikan bentuk dan fungsi gigi. **Kasus:** Penderita pria umur 22 tahun dengan fraktur mahkota horizontal pada gigi anterior. Penderita tersebut menginginkan perawatan estetik untuk mengembalikan bentuk dan fungsi giginya. **Tatalaksana kasus:** Fraktur akar horizontal gigi anterior dengan pulpa terbuka oleh karena trauma gigi dapat direstorasi dengan perawatan endorestorasi. Perawatan endodontic dengan pasak dan inti dimasukkan ke dalam saluran akar dapat meningkatkan retensi. Kemudian mahkota porselen dapat mengembalikan bentuk dan fungsinya, karena itu dapat meningkatkan percaya diri pasien dan fungsi giginya. **Kesimpulan:** Perawatan endorestorasi pada gigi anterior dengan fraktur mahkota horizontal dan pulpa terbuka dapat mengembalikan fungsi estetik dan percaya diri pasien.

Kata kunci: Trauma gigi, fraktur mahkota horizontal, perawatan endorestorasi

Correspondence: Nanik Zubaidah, c/o: Departemen Konservasi Gigi, Fakultas Kedokteran Gigi Universitas Airlangga. Jl. Mayjend. Prof. Dr. Moestopo 47 Surabaya 60132. Indonesia. E-mail: nanikzubaidah@yahoo.com

INTRODUCTION

Dental traumatic injuries are the main cause of emergency treatment in dental practice. It occurs in young patients with varying severity from enamel fractures to avulsion.¹ Dental trauma can cause damage to pulp, with or without either crown or root damage. The percentage of maxillary of anterior tooth fracture is high, and 90% of them are caused by protrusive teeth which are not covered by lips stand out, so they can not quite be covered by the lips.²

The dental trauma followed by anterior tooth fractures, especially permanent incisors can cause a strong psychological impact on young patients. Dental trauma involving extensive loss of tooth structure can cause pain, discomfort and bad appearance. With recent advances in esthetic Dentistry, restoration treatment has caused high expectations for the patients to be able to smile with confidence.^{3,4}

Crown fracture is a fracture that involves enamel and dentin. Tooth fracture accompanied by open pulp is considered as complicated. The number of complicated crown fracture cases is about 2–13% of all trauma cases, and most of them involves first maxillary incisors, which are frequent in children, according to Chan,⁵ it is about 5-20%. Horizontal fracture cases, occur more frequently than the vertical ones. Various kind of fractures usually occur because of severe trauma, 3% of which are caused by traffic accidents and trauma obtained at the time of exercise, while others are caused by trauma obtained in crime and rape cases.^{6,7}

In addition, strong frontal and horizontal force can produce fracture line from some point on crown to mesial or distal subgingival regions with or without the involvement of pulp. According to Ellis, the classification of dental fractures consists of six basic categories, namely: enamel fractures, dentin fractures without pulp exposure, crown fractures with pulp exposure, root fractures, luxation teeth, and intrusion. Crown fractures can be classified into three classes.² It is because the degree of pulp exposure can vary from small open pulp to fully open coronal pulp.^{6,8,9} There are four kinds of possible treatments for horizontal crown fracture with pulp exposure: pulpotomy (vital pulp), apexification (necrotic pulp), pulpectomy (endodontic treatment), and root resection.¹⁰ In dentistry, especially in esthetic restoration, horizontally fractured crown with pulp exposure needs to obtain endorestitution treatment involving endodontic therapy using retention, such post core and jacket porcelain crown.^{1,7}

The purpose of this case report is to inform that crown fracture with pulp exposure due to trauma can be managed through endorestitution treatment to restore the form, function and esthetics. The success of treatment, however, depends on the careful selection of cases based on clinical and radiographic examination. In other words, the treatment must be planned carefully to avoid accident, such as root fracture or extensive periodontal ligament damage.

CASE

The patient was a 22 year old man who came to the Dental and Oral Medical VIP Hospital of the Faculty of Dentistry, Airlangga University, Surabaya. The patient come three days after he got a traffic accident in which he fell off from the bike with fractured and cracked of teeth 12, 11 and 21, and swelling around the vestibule of the teeth 12, 11 and 21 and the upper lip. The patient wanted aesthetic improvement for his anterior teeth and hoped that the original esthetic and function can be restored.

Based on intra-oral examination it was known then there was horizontal complicated crown fracture tooth 11. It was also known that there was horizontal complicated crown fracture on tooth 12, but the condition of the fracture was crown still in place, in the center of the crown, involving enamel, dentin, and the pulp, while there was a minor crack only in the center of the crown of tooth 21 involving the enamel and dentin (Figure 1).

For the purposes of diagnosis and treatment planning, local x-ray and panoramic photographs were taken. Based on the results of the radiographic photos, it was known that there was radiolucency on the periapical region of tooth 11, and there was also crack on tooth 12 involving dental pulp. It was also known that the diagnosis of teeth 12 and 11 was irreversible pulpitis, while the diagnosis of his tooth 21 was reversible pulpitis. Therefore, the dental treatment plan for tooth 21 was by conducting composite veneer restoration (direct veneer), while the dental treatment for teeth 12 and 11 were endodontic treatment (pulpectomy vital treatment) accompanied with post and porcelain jacket crown made of zirconia materials using dental CAD/CAM method.

CASE MANAGEMENT

When the patient came at the first time, emergency treatment conducted consisted of cleaning the soft tissues around his mouth and lips by using saline and hydrogen peroxide, inducing antibiotics, analgesics and anti-inflammatory, using chlorhexidine mouthwash, giving instructions to maintain oral hygiene and soft diet that are recommended. It is because this treatment could help the patient avoid anything more severe than soft-tissue edema.⁶

Next, capturing printed images on his teeth 11, 12 and 21 which were traumatized was conducted before further treatment (Figure 1). Then, the maxillary and mandibular tooth anatomy was printed both for the study model and dental record, and also for diagnosing occlusion and relation that might occur as well as for preparing jacket crowns on teeth 11 and 12 in order not to reduce the esthetics of those teeth during the treatment.

Afterwards, pulpectomy treatment was conducted on the teeth 11 and 12 in one visit by using both crown down pressureless technique with preparation tools, such



Figure 1. The condition of teeth 12, 11, 21, and 22 before the treatment.

as file ProTaper, and single cone filling technique with endomethason sealer pasta materials. Next, the preparation of post canal was conducted by taking guta percha point with gates gliden drill, and then peeso reamer leaved approximately 4–5 mm area from the apex of the root canal. After that, the insertion of post with tapered serrated type (Unimetric) cemented by using type I of glass ionomer cement (Luting cement). And then, the core post was made by using composite resin (Figure 2).



Figure 2. The insertion of post on teeth 12 and 11.

The preparation of the teeth 11 and 12 with cervical line and chamfer shape was conducted by using tapered fissure bur and wheel-shaped diamond bur (Figure 3). After that, those teeth that had already been prepared were impressed by using double impression technique using elastomer impression materials with injection and putty types. The next stage was setting temporary crowns on those teeth, and sending the cast to a dental laboratory for making all porcelain jacket crowns made of zirconia materials. And then, all porcelain jacket crowns were cemented on teeth 11 and 12 using adhesive bonding technique (Figure 4).

After that, the restoration of the direct veneer composite was conducted on teeth 21 by using light cure microfill composite material (Figure 4). First, the teeth were cleaned, and the proper shade that matched with the original shade of next teeth was chosen. Second, those teeth were isolated with cotton rolls and retraction cords. Third, preparation was conducted with a coarse and round end diamond instrument after the insertion of all porcelain jacket crowns



Figure 3. The preparation of teeth 12 and 11.



Figure 4. The condition of the teeth 12, 11 and 21 after treatment.

in order to get similar composite shade to the shade of the porcelain crowns for esthetic purpose. Fourth, window preparation was conducted with a depth of 0.5 mm and tapered shape towards the gingival margin with a depth of 0.2 mm, and then it was etched, washed, dried. Bonding agent was applied and cured for 20 seconds, and then was coated with microfilled composite resin and cured for 20 seconds. The composite was placed a little too much to get contouring, particularly along the gingival margin, to reduce the effects of polymerization contraction. The polishing was conducted by using fine finishing diamond bur and silicone rubber with polishing pasta for the resin composite. And, the patient was finally asked for control 1 week, 1 month, 6 months and 1 year after the treatment.

DISCUSSION

Various conditions of trauma can cause crown fractures although many literatures suggest several predominant causes, such as trauma while playing and running or during sports activities, traffic accidents, and hit on face. Anterior teeth are more susceptible to trauma, approximately 80% of maxillary incisors followed by maxillary lateral incisors and central mandibular incisors.¹

In this case, it is known that tooth 11 suffered complicated horizontal crown fracture, while tooth 12 suffered with complicated horizontal crown fracture in the middle of the crown involving enamel, dentin, and pulp, but the condition of the crowns had already attached each other. It is also known that tooth 21 suffered with fracture only

at enamel layer and thin dentin layer, so composite veneer restoration was conducted on the tooth 21. Meanwhile, pulpectomy endorestitution treatment was conducted on teeth 11 and 12 in which the retention of prefabricated post and the core of the composite were inserted, and all porcelain jacket crown was set. If an open fracture of crown with pulp is reported to the dentist after 72 hours or more, the option will only be endodontic treatment by removing the entire pulp tissue; but if the fracture is more than ½ of coronal lost, post-core and crown will be required. The post-core restorations are used to reshape the structure of the lost crown.^{3,7}

The principle of dental care for those who have experienced endodontic treatment is actually to restore dental root and crown by using retentive and stable post crown, so it will not easily separated and can be used as long as possible in the oral cavity as same as the original ones. Tooth that has got endodontic treatment, moreover, is relatively more brittle and prone to fracture than the vital one because of tooth internal moisture that is reduced during endodontic treatment and can weaken the remaining tooth structure, furthermore, and a non-vital tooth often disclosed.⁵

Endodontic treatment was conducted on teeth 11 and 12 in one visit because the form of the root canals is normal, mild periapical abnormality with no clinical symptoms. This efficient time for the treatment was suitable with the activities of the patient as a student who was so busy in collage. This one visit endodontic treatment aimed to prevent the spread of diseases of the pulp to the periapical tissues or if it has occurred, it will aim to restore the periapical tissues. It also gives the advantage to reduce the risk of infection that may occur between visit periods, and to save time.² The preparation of root canals 11 and 12 was then conducted by using crown down pressureless technique with ProTaper instrument conducted with coronal-apical approach. This technique is advantageous since most of the microorganisms located in 1/3 coronal and 1/3 center had been cleaned before getting into the apical regions, and the irrigation is more perfect in 1/3 apical.¹¹

The intracanal retention was conducted in order to restore the crown shape of the post used as the retention of the restoration. Post used in this case was prefabricated post since the post has several advantages, namely more effective and efficient as it can be completed only in one visit, more variety in design as a result, it can meet the needs of patients concerning with the condition of their treated teeth, as well as stiffer and stronger as it is made of metal. This kind of post then can be classified as the passive one. During cementation, this passive post, moreover, requires no pressure on the post canal, so it can reduce the risk of fractures. The taper of the post even is almost like the natural shape of the root canal. The cementation process of this manufactured post in root canals then was followed by the formation of the core with composite resin because it has advantages in terms of aesthetics, compressive strength, and rapid hardening so that it can be readily prepared, easily

manipulated, and dimensionally stabilized with minimal edge leakage.^{12,13}

The selection of the final restoration involving all-porcelain jacket crowns made of zirconia materials by using CAD/CAM method is actually considered as the best choice since zirconia material is metal-free restorative material with high-quality ceramics in esthetic factors as well as high-tech ceramic material that has characters of stability, biocompatibility, higher strength than other ceramic materials, and higher fracture roughness than other restorative materials.¹⁴ Similarly, the results of Qualthrough's research¹⁵ also states that among 956 patients, only 63% of whom felt satisfied when one of their anterior teeth was crowned, while 79% of whom were satisfied when 4 or more of their anterior teeth were crown with porcelain. Hume,¹⁶ also declares that the use of porcelain jacket crown is the best way to restore the first incisive teeth with optimal esthetics. According to Bulem,¹⁷ porcelain is actually considered as the most satisfying material for patients due to its natural color and aesthetics. Furthermore, cementation of porcelain jacket crown towards post and core by using resin cement (dual cure bonding system) actually depends on the increasing of the retention of passive post retention that is linear with that of active post since resin cement has both better tensile bond strength than glass ionomer cement, and also better shear bond strength than phosphate zinc cement.¹²

The composite veneers was conducted on tooth 21 since the tooth was suffered from minor cracks located in the center of the crown only involving enamel layer and thin dentin layer with reversible pulpitis diagnosis. The cost of the treatment was cheaper than that with veneer ceramic (porcelain) since there was no laboratory cost and it needed only one visit. The making of dental restoration on the fracture depended on the width of the coronal structure of the dental fracture. Thus, if the fracture only involved enamel and dentin, it then can be restored with composite or porcelain laminated veneers.¹⁸

It can be concluded that horizontal crown fractures due to trauma can be treated with endorestitution treatment in order to restore the form, function and esthetics of the teeth in accordance with their original ones.

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