Management of malocclusion after maxillofacial trauma

Abstract

Malocclusion is one of the most common and often difficult-to-manage complications associated with post-traumatic maxillofacial injury. Maxillofacial injury is considered an important health problem worldwide. Such injuries most often have significant financial consequences and result in deformity of facial aesthetics, loss of function, and increased incidence of other health problems. Many common treatment approaches are extraction of teeth, occlusal adjustments, functional therapy, or a combination of these. An appropriate treatment plan should typically involve orthodontic treatment because it can prevent multi-segment upper jaw operations and stabilize the arches by coordinating and aligning them. The most common and important form of post traumatic malocclusion is malocclusion secondary to condylar fractures. Patient may complain of an open bite with functional disturbances, facial asymmetry. There is also improper alignment of teeth, frequent biting of the inner cheeks or tongue, discomfort when chewing or biting. Management approach of secondary malocclusion after maxillofacial trauma should include prosthetic treatment, orthodontic treatment, and implant-supported rehabilitation.

Keywords: Malocclusion, functional therapy, facial asymmetry, prosthetic treatment

Introduction:

Maxillofacial injury is considered an important health problem worldwide. Such injuries most often have significant financial consequences and result in deformity of facial aesthetics, loss of function, and increased incidence of other health problems. Furthermore, another problem a patient experiences because of maxillofacial injuries is psychological effects. (1)

Head injuries can present in several patterns. Malocclusion is the most common complication, followed by facial deformity, temporomandibular joint disorder (TMD), and neurological symptoms. (2)

Malocclusion is defined as an abnormal occlusion in which teeth are not in a normal position in relation to adjacent teeth in the same jaw and/or the opposing teeth when the jaws are closed.8 Overjet 3 mm, inadequate lip coverage, and mouth breathing were found to have a strong association with TDI. (3)

Surgeons aim to prevent any situation that could worsen a patient's health when restoring aesthetics, function, and anatomy. Victims of such injuries are usually exposed to other types of injuries such as orthopedic and neurological traumas. Moreover, maxillofacial traumas co-occur with other injuries, which might prevent immediate surgical correction. Such delay put the affected individuals at an extremely high risk of developing many problems such as infections, non-unions, and malocclusion. (4)

Patients returning for further correction of their secondary problems such as malocclusion after initial healing is common. The greatest problems with which patients return are asymmetrical teeth and occlusal dysfunction. Although secondary malocclusion occurring post-treatment is quite common, it has rarely been reported in the literature. (5)This complication can be found either in the anterior or posterior part of the upper or lower jaw. Prosthodontic treatment, orthodontic treatment, surgical fracture reduction, surgical repair of soft tissues, and orthognathic surgery are among the many approaches available for correcting the resultant malocclusion. Dental casts, radiographic, and photographic images should be considered and acquired preoperatively. Commonly, three dimensional stereolithographic models are used in the management of such injuries to design an appropriate treatment plan and for accurate surgery. (6)

Etiology and clinical presentation:

Malocclusion is one of the most common and often difficult-to-manage complications associated with post-traumatic maxillofacial injury. The risk factors that can result in post-traumatic malocclusion are: falls, accidents, contact sports and violent and risky

behavior, environmental, and socio-economic risk factors. The most common form of post traumatic malocclusion is malocclusions secondary to condylar fractures. (7)

Because mandible is such a unique structure with hinge joint and masticatory muscles attached to the body of mandible, attention must be paid to avoid displacement during treatment. Displacement during fracture reduction leads to malocclusion that it can result in:

an open bite with functional disturbances, reduced posterior facial height and facial asymmetry. There is also improper alignment of teeth, frequent biting of the inner cheeks or tongue, discomfort when chewing or biting, speech changes, including the development of a lisp breathing through mouth rather than nose. (8)

Management:

Treatments of head and face injuries are categorized into surgical and non-surgical methods. Facial skeleton fractures should be reduced as early as possible to restore optimal function and minimize skeletal and soft-tissue deformity. (9)

Many common treatment approaches are extraction of teeth, occlusal adjustments, functional therapy, or a combination of these. An appropriate treatment plan should typically involve orthodontic treatment because it can prevent multi-segment upper jaw operations and stabilize the arches by coordinating and aligning them. In addition, prosthetic treatment after surgery is commonly required to restore missing teeth. (10)However, studies summarizing the evidence regarding the role of prosthetic treatment, orthodontic treatment, and implant-supported rehabilitation for the management of secondary malocclusion after maxillofacial trauma are lacking. Therefore, a comprehensive and systematic review of the literature was conducted to summarize the available evidence regarding the role of different management approaches such as prosthetic treatment, orthodontic treatment, and implant-

supported rehabilitation for the management of secondary malocclusion after maxillofacial trauma to inform healthcare providers. (11)

Orthodontic treatment:

Orthodontics is the branch of dentistry concerned with the growth of the jaws and face, the development of the teeth, and the way the teeth and jaws bite together. It also involves treatment of the teeth and jaws when they are irregular or bite in an abnormal way, or both. (12) Teeth may not bite together correctly due to any combination of problems in the positioning of the teeth, jaws, lips, tongue or cheeks; these can be affected in some cases by a habit, such as thumb sucking, or by the way in which people breathe. The need for orthodontic treatment can be determined by looking at the effect any particular tooth position has on the life expectancy of the teeth or by the effect that the appearance of the teeth has on how people feel about themselves, or both. (13)

Fixed appliance:

It consists of small metal (or porcelain) attachments called brackets, fixed to your teeth with a special dental adhesive. The attachments are easily removed at the end of treatment, leaving your teeth unharmed. A wire and elastic components link these attachments and it is these that apply the force to move your teeth. For the first 2-3 days the brackets may rub a little on the lips and cheeks. This is because the lips and cheeks are not used to the brackets being there. After a few days the lips stop bumping into the brackets and any soreness will settle. (14)

Clear Aligner Therapy:

With the recent increase in seeking orthodontic treatment, there has been a corresponding increase in demand for appliances that are both more aesthetic and more comfortable than conventional fixed appliances. (15)

As with fixed appliance systems, the term Clear Aligner Therapy (CAT) embraces a wide range of appliances with differing modes of action, methods of construction, and

applicability to various malocclusion treatments. All share the use of clear thermoformed plastic aligners that cover many or all of the teeth, but from that common point, there are major and significant differences which affect the ability of any given system to treat a wide range of orthodontic problems. (16)

CAT was initially introduced to treat minor irregularities of tooth position only. Some aligner systems remain deliberately and explicitly limited to the correction of minor positional irregularities whilst others also claim to target complex malocclusions. (17)Published clinical evidence supporting such claims is either lacking or, for the most part, well short of high-level scientific evidence. Nevertheless many CAT systems are marketed directly to the public, and some (Crystal Braces, Smile Care Club) do not even require the intervention of any dental practitioner at any stage in the process.

Some CAT systems incorporate the use of bonded resin attachments on teeth to increase the scope of aligner treatment to cover movements otherwise considered difficult or impossible for CAT to achieve. (18)

Prosthetic treatment:

Fixed prosthodontic treatment involves replacement of lost natural teeth using fixed artificial substitutes with an aim to restore function, esthetics and comfort. Although the preparation of healthy abutment teeth makes them less desirable, fixed dental prostheses (FDPs) are still preferred because of their strength, esthetics, less cost, satisfactory retention and lack of any surgical preparation. (19)

Over the years, the success and survival of FDPs has been estimated and reported. These restorations generally demonstrate longer life and durability in clinical service.

Like all other dental restorations, FDPs are liable to failure. Despite the high survival rates, FDP complications are frequently encountered. FDP failures are a multi-factorial phenomenon and the failure can be attributed to several different factors. (20)Complications can be categorized as biological such as caries, pulpal pathologies and

periodontal issues or technical problems like decementation, ceramic chip-off, aesthetic failures or fractures. A few authors attribute these failures to a lack of clinician's skill, faulty technique or poor material choice. (21)

Crucial factors to a good long-life performance of dental prostheses are strength, intraoral ageing resistance and fatigue resistance. (22) Observed signs of pulposus or other negative symptoms of the natural tooth must be considered before treatment. Furthermore, dental prostheses should take into account the wear resistance and abrasion of the opposing natural teeth. Excessive abrasion of tooth tissue (more than 29 µm per year) caused by the dental prostheses should be avoided since it jeopardizes the health and function of the juxtapose natural teeth. (23)

Patient comfort is one important parameter used to evaluate the success of the dental prostheses. From this point of view, fixed prostheses are favored over removable prostheses. Fixed prostheses are tooth- and/or implant- supported and are fixed through adhesion or mechanical locks. (24) In contrast, removable prostheses are tooth and mucosa co-supported; therefore, a denture base and connectors are unavoidable. Foreign body sensation becomes more obvious when a larger denture base and more connectors are applied. A metal base and connectors also decrease the visual aesthetics. These negative effects are the main reasons why fixed treatments are favored over removable prostheses in prosthodontic dentistry. (25)

Besides restoring oral function and appearance, dental prostheses should maintain or improve the general health of the patient. Firstly, restorative materials must have a good biocompatibility, which is the ability of esthetic materials or appliances to be used without any toxic or injurious effects on patients' biological systems. (26)

Implant-supported rehabilitation:

Implant-supported rehabilitation is that aspect of dentistry that permits dental rehabilitation, the maintenance of mastication function and the patient's appearance by

replacing one or more teeth with a crown or prosthesis supported by osteointegrated implants. (27)

Rehabilitation with dental implants offers many advantages including the preservation of the alveolar bone from resorption that occurs following tooth loss, improvement of facial esthetics and enhancement of the removable prosthesis stability and retention. (28)In cases of single tooth replacement, implants are considered the treatment of choice as it does not require the preparation of the adjacent teeth as abutments which is needed in fixed partial dentures. (29) Additionally implant placement results in the preservation of the height and width of the alveolar bone. The process of dental implant osseointegration as well as the successful and vital role of dental implants in oral rehabilitation has long been established through years of follow up and research.

Implant-supported rehabilitation always involves a number of essential steps:

1. Preliminary pre-surgical and pre-prosthetic patient assessment
2. Treatment planning and informed consent
3. Surgical phase and follow-up
4. Post-surgical assessment
5. Prosthetic phase and follow-up
6. Professional and personal maintenance phase
7. Managing complications (30)

Conclusion:

Maxillofacial injury is considered an important health problem worldwide. Such injuries most often have significant financial consequences and result in deformity of facial aesthetics, loss of function, and increased incidence of other health problems. Victims of such injuries are usually exposed to other types of injuries such as orthopedic and neurological traumas. Malocclusion is one of the most common and often difficult-to-manage complications associated with post-traumatic maxillofacial injury. Patients

returning for further correction of their secondary problems such as malocclusion after initial healing is common. The greatest problems with which patients return are asymmetrical teeth and occlusal dysfunction. The risk factors that can result in post-traumatic malocclusion are: falls, accidents, contact sports, violent and risky behavior, environmental, and socio-economic risk factors. The most common and important form of post traumatic malocclusion is malocclusion secondary to condylar fractures. Patient may complain of an open bite with functional disturbances, facial asymmetry. There is also improper alignment of teeth, frequent biting of the inner cheeks or tongue, discomfort when chewing or biting. Management approach of secondary malocclusion after maxillofacial trauma should include prosthetic treatment, orthodontic treatment, and implant-supported rehabilitation.

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