Successful Closed Reduction and Tooth-to-tooth Wire-fixation of a Mandibular Singular Parasymphysis Fracture in a Male Collegiate Lacrosse Player

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Successful Closed Reduction and Tooth-to-tooth Wire-fixation of a Mandibular Singular Parasymphysis Fracture in a Male Collegiate Lacrosse Player

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Introduction: A 19-year-old male collegiate lacrosse player suffered an acute singular parasymphysis fracture of the mandible when he was struck in the facemask of his helmet by a lacrosse ball during practice. Diagnostics and Treatment: The fracture was confirmed via panoramic radiography and treated with a closed reduction under local anesthetic by looping a 26-gauge wire around the two right incisors and the right cuspid. The fracture healed and aligned properly, and after six weeks, the patient was cleared for competition and returned to full activities, with no complications. Discussion: The decisions to use a closed reduction and wire-fixation for managing the fracture instead of an open reduction and plate application was taken so as to be less invasive with the hope of a faster recovery and fewer complications. Conclusion: The importance of this case report is to show that closed reduction is a viable, if not the preferred, treatment for mandibular fractures in certain cases and healthcare professionals, such as athletic trainers, working with lacrosse players should be familiar with this treatment strategy. Key Words: athletic training, lacrosse, mandible, mandibular fracture

INTRODUCTION
Lacrosse is a growing sport in the United States, especially at the collegiate level. The number of collegiate athletes playing lacrosse has grown considerably in recent years, and the National Collegiate Athletic Association (NCAA) reports that over 28,000 athletes – 15,180 men, 12,921 women – participated in lacrosse during the 2020-2021 season.¹ The sport, for the men’s classification, is considered a “high-contact sport” because “body and stick checks are permitted and players wear full protective gear including a helmet with face guard, mouth guard, shoulder pads, arm pads, and gloves” (p. 537).² The women play a non-contact version of the game, and, as such, the field players wear only eyewear and mouthpieces for protection, but the goalkeepers wear a full assortment of protective equipment.³

With the men’s version being “high-contact,” injuries are expected and do occur. Historically the highest percentage of injuries involved the head and face (18%), with 8.8% of those being fractures.² As of 2021, knee (15.1%), thigh (12.3%), and ankle (11.6%) injuries outranked head and face (10.5%) injuries in prevalence, with fractures accounting for roughly 4% of all lacrosse injuries.⁴ Fortunately, mandibular fractures, in the men’s game at least, are infrequent because of the protection provided by the helmet and facemask. Conversely, as mentioned earlier, girls and women do not wear protective equipment other than eyewear and mouthpieces – with the exception of the goalkeepers – because their sport is played as a “non-contact” game. In return, they have higher rates of head and face injuries than the boys and men,² resulting in some calling for mandatory protective equipment, i.e., mouthguards and helmets with facemasks, for the female athletes.³

USA Lacrosse, the national governing body for the sport, serves over 400,000 members, indicating that the sport is incredibly popular in the United States, with over 15 times as many athletes participating on the club and interscholastic levels as compared to the intercollegiate level.⁵ Information about the game and its common injuries is critical to the safety of these athletes. Unfortunately, despite its dramatic growth over the last few decades, lacrosse is not a commonly covered sport by
athletic trainers across the United States because of its prevalence in the club setting rather than the scholastic and intercollegiate environments; the latter have coverage, but the former often does not.

Despite the lack of adequate coverage by certified athletic training staff, lacrosse players still play regularly, and injuries happen. Fortunately, facial fractures are rare in lacrosse, but can be serious. The proper diagnosis of such conditions is imperative so that the appropriate treatment may begin and a full recover can occur. The treatment of a fracture is typically either a closed reduction or an open reduction, depending on its type and severity, coupled with some form of fixation. Despite strong evidence indicating that open procedures often lead to more complications than closed procedures, it has had a limited effect on reducing the reliance on open repositioning and internal fixation.6 The purported advantages for open and closed techniques are presented in Table 1. Research has indicated that “open reduction carries a higher risk of postoperative complications [and has] ...almost a twofold increase in the complication rate” (pp. 19-20), 6 suggesting that closed techniques may be the more prudent choice for treatment.

We present the case of a male collegiate lacrosse player who suffered a mandibular fracture upon being hit in the facemask by a lacrosse ball. After surgical fixation via closed reduction and tooth-to-tooth wire-fixation, the athlete returned to play with no further complications. This case report demonstrates that closed reduction can be successful in the treatment of mandibular fractures, and its availability and implementation should be known by healthcare professionals, such as athletic trainers, especially those involved in the sport of lacrosse. Case reports such as this should help to add to the literature regarding lacrosse injuries and their successful treatment methods, enhancing the likelihood of proper treatment.

**CASE REPORT**

A 19-year-old NCAA Division II male lacrosse player (178 cm, 80 kg) with no previous history of facial injuries was struck in the facemask with a lacrosse ball at practice and immediately exited the field. The initial evaluation determined that the athlete was bleeding from his lower right teeth, and rapid onset edema was present. Upon palpation, the evaluating athlete trainer discovered point tenderness over the right anterior mandible. The bleeding, which originally led to the athlete’s removal from play, was not stanchced after 15 minutes of management efforts. The combination of uncontrolled bleeding, point tenderness, and edema resulted in the athlete being referred to the local hospital’s emergency department for further evaluation.

Evaluation in the emergency department revealed the patient was unable to close his mouth comfortably, but that no teeth were loose. The attending physician determined a class II occlusion was present, and a mandibular fracture was evident. The athlete was referred to a dental surgeon* and was seen two days later.
During the appointment with the dental surgeon, panoramic radiographs were taken. A right mandibular parasymphysis fracture was noted, with a 1- to 2-mm separation between the right lower cuspid and the right lower lateral incisor (Figure 1). The dental surgeon decided to treat the fracture via a closed reduction and external fixation via tooth-to-tooth wiring while the patient was under local anesthesia. A closed technique was chosen because of the specific type of fracture and the fracture site, the possibility of fewer complications, and the higher likelihood of a faster recovery.

The patient was placed in a supine position, and the local anesthesia was injected into the right mandibular area. After the anesthetic took effect (~10 min), a 26-gauge wire was looped around each side of the fracture site – the two right incisors and the right cuspid – and the wire was tightened until the fracture was reduced to the proper position. No complications were noted.

Two days after surgery, panoramic radiographs were taken and indicated the fracture was aligned properly and that positive signs of bone healing were present (Figure 2). During the eight-day post-operative examination, the patient’s bite had maintained alignment, but the wire had loosened slightly. The wire was tightened to support the proper positioning of the teeth and bone, and the athlete was released for non-contact activities. A final examination occurred a month later, where the wire was removed, and a final panoramic radiograph was taken. The radiograph revealed that the fracture had healed properly (Figure 3). The athlete was fitted with a customized lower-tooth guard and released for full-contact activities. He went on to complete the athletic season, with no complications. His lifestyle was not affected, either, with respect to his bite, diet, or daily activities, and he was determined to have fully recovered.
DISCUSSION
We present a case of a male collegiate lacrosse player who experienced a fractured mandible from being struck in the facemask by a lacrosse ball during practice. The case is interesting because of how the fracture was managed using closed reduction and external fixation via tooth-to-tooth wiring, and the information from this case is important for healthcare professionals working within the sport of lacrosse.

Head and face injuries still account for over 10% of all injuries related to lacrosse.4

Figure 2. Panoramic radiograph showing the closed reduction, with an aligned mandible, and positive signs of bone healing

Figure 3. Healed mandible, with correct alignment
Fortunately, with the men’s game, the athletes are required to wear protective equipment such as helmets. Nonetheless, the mandible is the second-most fractured bone in the facial area, and this study demonstrates that even while wearing a helmet, a male lacrosse player still can suffer a broken mandible. In the girls’ and women’s game, head and face injuries are more common, largely because they wear no protective helmets, which is cause for alarm but beyond the scope of this case report.

While mandibular fractures are rare in lacrosse, they do occur, mostly from contact with a lacrosse stick or ball, making them unique. In addition to the mandibular fracture being unique, the method by which this fracture was treated was unique as well. Closed reduction – meaning bringing the two affected parts together without an incision – is not as commonly used as open reduction for mandibular fractures, yet it seems to have fewer complications for infection, vascularity disruption, nerve injury, and foreign-body introduction into the healing site compared to open reduction. In fact, closed reduction combined with fixation methods such as wiring, teeth-bonded arch bars, and wire- and cement bonding often are successful and do not require general anesthesia nor operating room time. Further, in reference to numerous mandibular fractures being treated with these techniques, no tooth loss was reported, no infections occurred, and nonunion of the bone never happened; Baurmash concluded, “Therefore, the 0% of nonocclusal complications and the absence of any tooth loss with all of the 64 cases treated must have some significance.” We agree. Our current case supports his assertion as well, and it aligns with the results of Andreasen et al.’s review.

The cost-benefit analysis of open reduction versus closed reduction is noteworthy. Closed reduction is less expensive because little hardware is needed, the procedure is performed under local anesthetic, usually as an outpatient service, and thus avoiding associated costs for an operating room and anesthesiology. Moreover, new technology in the form of “dental occlusion ties” is being developed and tested, with promising results of faster and more efficient treatment times, fewer intra-oral obstructions, a reduction in the risk of sharps injury, and possibly less gingival trauma. More research is needed, of course, but the idea seems promising.

Lastly, using a dental surgeon to perform the procedure instead of a physician specializing in otolaryngology was atypical. Depending on the severity of the injury and the procedures needed to treat a mandibular fracture, using a dental surgeon employing closed reduction and an appropriate fixation technique can be effective, may have fewer complications, and could be more financially viable.

**CONCLUSION**

Lacrosse is a growing sport in the United States. With this growth, more injuries occur, especially to the head and face. Mandibular fractures, while uncommon, do occur in lacrosse, and healthcare professionals, such as athletic trainers, should be familiar with how best to treat them. Research indicates that closed reduction and specialized fixation techniques can be successful, less expensive, and have fewer complications than open reduction and invasive fixation techniques. The current case supports this premise. Additionally, using a dental surgeon to care for a mandibular fracture instead of a physician specializing in otolaryngology may be atypical, but that decision in this case, clearly, was effective.

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Murray, Leadford, Snyder, Pettitt & Hawkins. Successful Closed Reduction of Mandibular Fracture
REFERENCES


