Case Report

Mixed Martial Arts Injuries

Urgent message: Because typical participants in mixed martial arts are young and healthy, many present to urgent care settings with a clear musculoskeletal injury and no other medical problems. Do not be distracted by the most obvious injury. Injuries from atypical mechanisms of injury are common in mixed martial arts and should be considered when evaluating a patient who has sustained injuries while participating in the sport.

SAMANTHA DEBOLD-HAWLEY, MS-3, and JOHN SHUFELDT, MD, JD, MBA, FACEP

Introduction

Mixed martial arts (MMA) is one of the fastest growing sports in the United States.[1] Because of their age and mind-set, athletes who take part in the sport are less likely to seek treatment for their injuries at an emergency department and are more likely to present to an urgent care center. Most of the participants in this sport are young to middle-aged, with an average age of 31.7 years (standard deviation, ±3.5 years).[2] These athletes are conditioned to accept injury as part of their training, and as a result, they often do not present to medical care immediately or for return visits.

As an urgent care provider, you may be faced with a wide range of full-contact injuries sustained during participation in this intense sport that require a different approach to current protocols. In practice as well as in competition, athletes employ both (1) stand-up fighting, composed of kicks, knee strikes, and punches, and (2) ground fighting techniques designed to tap out their opponent with the use of joint manipulation and chokeholds. Often, the participants have little to no training prior to engaging in the sport, which contributes to the propensity for injuries. Injuries can range in severity from minor infections and soft-tissue damage to fractures, asphyxiation, and closed head injuries and can include facial lacerations, joint injuries, concussions, hematomas, corneal abrasions, infectious diseases, and tissue deformities. This article discusses the etiology of some of the

Samantha Debold-Hawley, MS-3, is a fourth-year medical student at Texas Tech Health Science Center in Lubbock, Texas. **John Shufeldt, MD, JD, MBA, FACEP**, is Principal at Shufeldt Consulting in Scottsdale, Arizona, and is on the Editorial Board of the *Journal of Urgent Care Medicine*.

most commonly presenting injuries and their management as made different by the sport of MMA.

Case Presentation

A 24-year-old athletic woman with no significant medical history presented to an urgent care center with new-onset diffuse pain and swelling of her left ankle. She reported that the pain began 30 minutes earlier during a sparring match at a local MMA facility. She said that she stood up from being placed in an ankle lock and then slipped and hit her head when she attempted to escape her opponent's hold. A bystander, who accompanied her to the urgent care center, reported no significant popping sounds and no loss of consciousness in the patient. The patient's left ankle pain was diffuse, located mainly on the lateral aspect of the joint, and was constant and throbbing. She rated her pain on a visual analog scale as being at 6 of a possible 10 points. There was increasing swelling and ecchymosis over the lateral aspect of the ankle. The patient was able to ambulate, but there was significant alteration in her gait, and movement and walking aggravated the pain. She reported that she had tried nothing to alleviate the pain. The patient had no significant findings on prior medical history, had no past surgical history, and said that she was not taking any medications except for what she described as supplements.

Physical Examination

At the patient's initial presentation, her vital signs were as follows:

- Oral temperature, 98.6°F
- Blood pressure, 122/76 mm Hg
- Heart rate, 92 beats/min
- Respiratory rate, 18 breaths/min

During a review of systems, the patient reported a mild headache with no change in vision, and no tinnitus, nausea, vomiting, or altered neurologic function. There were no concerning findings for any other systems.

On physical examination, a single 1-cm open laceration was apparent on her left supraorbital prominence; there were no signs of infection. When questioned about the laceration, the patient said that she was hit by her opponent moments before the ankle lock but did not experience significant pain or bleeding. She reported that her MMA coach then covered the laceration in petroleum jelly. She reported no tenderness to palpation over the supraorbital prominence and no significant bleeding. Neither concavities nor crepitus was noted on palpation of her face. However, there was a small hematoma under the facial laceration. Findings on cardiac and respiratory examinations were within normal limits. Neurologic examination produced no focal findings, and cranial nerves II through XII were grossly intact. On musculoskeletal examination, there was significant swelling and ecchymosis on the lateral aspect of the patient's left ankle. There was no tenderness on palpation of the knee or on compression of the tibia or fibula. She had significant tenderness of the lateral malleolus and decreased range of motion of the ankle joint due to pain. Findings on the Thompson test and the anterior drawer test were negative, and findings on the varus and valgus tests were both within normal limits bilaterally. There was no gross deformity of the joint except for swelling.

Diagnosis Results

Diagnostic Studies

Ankle x-rays were obtained. No other diagnostic studies were indicated.

Differential Diagnosis

For the patient's two issues, the differential diagnoses were as follows:

- Injury 1: simple ankle sprain, ankle fracture, tendon strain
- Injury 2: laceration of the left supraorbital prominence, supraorbital fracture

Diagnosis

The patient had an ankle sprain and a simple facial laceration.

Course and Treatment

The course and treatment of such injuries depend on radiographic findings. For this patient, findings on ankle radiographs obtained in the mortise, anteroposterior, and lateral views were negative for fracture. They showed minor soft-tissue swelling with no dislocation and no syndesmotic widening. The findings on physical examination suggested that the best treatment would involve immobilizing the ankle in either a brace or a boot for healing and advising the use crutches for a few days.

The patient was advised to refrain from overuse of the joint and was treated conservatively, with pain and swelling serving as indications for return to the urgent care center. She was instructed to follow up with her primary-care physician in 7 days and to return to the urgent care center for further imaging if the pain did not resolve

or she became unable to ambulate. She was instructed that if either issue occurred, she might need to undergo repeat radiography to rule out a developing fracture or magnetic resonance imaging to rule out tendon rupture.

The patient's facial laceration was irrigated with copious normal saline and closed with butterfly closures to allow for proper healing by secondary intention. If the wound had been larger, the use of sutures might have been indicated. Given that she did not have tenderness over the supraorbital prominence, bony deformity, or crepitus, it was unlikely that she had a displaced facial fracture. Because x-ray imaging in a patient with no loss of consciousness and no apparent displacement of facial bones would not significantly change treatment of her injuries, x-rays were not obtained.

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The patient was not given prophylactic antibiotics because the laceration was on the face, where the blood supply was good, and there were no obvious particulates in the wound. She was instructed to monitor the wound for signs of infection until it had healed, given the nonsterile cause of the wound.

Discussion

Lacerations

Lacerations in MMA are typically caused by blunt force of punches and kicks but may also be caused by the cutting forces of knees and elbows. The mechanism of action of the laceration should be taken into account in order to rule out any neurologic issues that must be examined further. Lacerations will most commonly present along the supraorbital ridge and must be sutured or closed with butterfly closures after cleaning with iodized saline. The closure must be done carefully because a wound that reopens easily can be the end of a fighter's career. Wound closure must be done in a way that will enhance the speed of healing of the wound without compromising the integrity of the scar by the speed of healing.[3] Many of these patients attempt to remove stitches themselves, so it is very important to inform them of the time needed for healing before stitches can be removed. The standard protocol is to keep the wound clean and dry for 24 hours after the repair and then to remove facial sutures within 3 to 5 days, scalp sutures with 7 to 10 days, and limb sutures with 7 to 10 days.[4] Prophylactic antibiotics are indicated if the wound had significant exposure to gym gloves or mats.

Infections

One of the most common medical concerns in patients who engage in MMA stems from the conditions of the facilities where they train. Infections are often spread, even without injury, from unsanitary conditions commonly found in MMA gyms. Because thorough cleaning of these gyms is rare, because athletes train with open wounds, and because a large number of athletes work in the confined space of a gym while perspiring, bleeding, and carrying microorganisms to mats and pads, infection must be considered a paramount target of treatment for all patients who participate in MMA. The list of microorganisms and viruses carried by these athletes is long, but the most common sources of infection are *Staphylococcus aureus* (including methicillin-resistant *S. aureus*), group B *Streptococcus*, *Tinea corporis*, and herpes simplex virus. These microorganisms can present as basic skin infections or as infections in open wounds and fractures. Although studies have demonstrated that prophylactic antibiotics should not be used for simple lacerations because they have not been shown to make a significant difference in infection rates over simple cleaning and that they instead select for resistant organisms,[5] studies do suggest the use of prophylaxis if infection is present or the wound is highly contaminated. The conditions in MMA facilities should increase the physician's suspicion for potential infections during wound healing. Because results of cultures will not be available for 2 days, treat the patient at high risk for infection with broad-spectrum antibiotics, such as penicillin, and a tetanus immunization.

Nonpharmaceutical prophylactic measures to suggest to patients include

- Showering immediately after training
- Using antimicrobial soaps
- Keeping open wounds covered
- Ensuring that mats have been cleaned before they are used in training

It is necessary to remind patients that their infections can be spread to sparring partners and to training mats.

Encourage them to keep their infected wounds covered and clean if they return to training. Because fungal infections are also very common, it is appropriate to recommend keeping azole antifungals at hand for rapid treatment of abrasions.

Musculoskeletal Injuries

Patients with musculoskeletal injuries from MMA present to urgent care centers because they speedily provide medical care. Boxing fractures—fractures of the metacarpals—and fractures of the distal interphalangeal and proximal interphalangeal joints usually result from poorly wrapped hands or poor technique, including punching with loose fists. These patients present with a swollen dorsal hand after contact with punching bags or with another body in a sparring match. Treatment should include radiographic verification of fractures, stabilization and immobilization of the hand, and restriction from using the injured limb.

Fractures of long bones are less common, but as a result of the frequency of high-impact bone-on-bone techniques involved in MMA, they are not atypical. Blocking and striking techniques have the goal of using long bones to block or injure other long bones. Common long-bone fractures are of the tibia, fibula, femur, radius, and ulna, and these occur when the patient has blocked or landed a strike on an opponent. If the patient presents with a compound fracture, the limb should be immobilized and the patient should be transported to a facility with an operating room to be prepared for surgery. Severe hematomas should also be part of the differential diagnosis when there is a femur or lower limb involved, because of the high incidence of bone-on-bone contact.

Patients usually present to an urgent care center hours to weeks after sustaining joint injuries because of the tendency of fighters to attempt to walk the injuries off. For some, dislocations are so common that they know how to set their own and will do so without medical assistance. Some of these dislocations can cause compound injuries and break through the dermis without the presence of a fracture, in which case the patient must be transported for surgery. Patients present with a hot and swollen joint that may still be displaced from the joint capsule. In the case of an active dislocation, give pain medication and reduce the joint as indicated by the mechanism of injury. Refer to Joint Commission protocols for joint reductions. Dislocations are commonly caused by ground submissions, which include joint locks specifically designed to dislocate and break joints. This can, in the long term and without proper treatment, cause bursitis, tendonitis, and arthritis. Each of these can be detrimental to the career and life of a fighter and should be treated as work-inhibiting injuries. Patients with these injuries present with joint immobility, swelling, and even clear musculoskeletal deformities. Range of motion of the joint may be poor, especially when limb-guarding (the primary indication for dislocation) and other signs are missed.[6] After joint reduction, instruct patients to wrap, support, ice, and rest the joint. Although restriction of movement is important to healing, fighters often will go back to training too early and will cause themselves permanent injury. Be sure to inform patients that movement restriction for a period of time will allow them to practice their sport longer. Because MMA kicks involve torque on the knee and the hip and complete rotation on a planted foot, the probability of tears of the anterior cruciate ligament, medial collateral ligament, and meniscus is increased. For diagnosis, obtain images of the joint capsule. Determine the appropriate treatment on the basis of clinical presentation and image findings. The patient may require surgery or rehabilitation for the injury and should be referred to the appropriate specialist.

Closed Head Injury

The goal of most MMA bouts is to submit or knock out the opponent, and thus facial injuries are likely to occur. Fighters take many hits to the nose, jaw, and orbit. Though the participants wear gloves, the gloves often weigh no more than 8 ounces (and MMA gloves can be even lighter), providing little to no protection from impact. Though mouthpieces are worn to protect against dental injuries and nerve-injuring blows, the force of the punch is usually enough to render an opponent unconscious. In a fight, it is very common to cause a broken nose, a fractured jaw, loss of teeth, and even orbital fractures. Be sure to keep these on a differential diagnosis for a fighter presenting with head trauma or facial pain. The injuries may be masked by massive swelling and bruising of the area, but given the mechanism of action and strength of impact of the injuries, do not discount trauma to the facial bones in a differential. Fighters often present with broken noses from direct shots to the face. Some patients may need to have their nose set to prevent permanent septum damage. If there is trauma to the anterior nasal septum, be sure to screen for a septal hematoma that, although rare, can cause a saddle-nose deformity, abscess, or perforation.[7] Because it only takes 3 days for the septum to become infected,

urgent hematoma drainage should be performed. Another complication of a facial impact in MMA is mandibular fracture, for which the first line of treatment is to ensure a patent airway before stabilizing the fracture.[8] Once the patient's condition is stabilized, the patient should be transported for internal fixation.

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Concussions are common and are typically the goal of an MMA match. Treat patients who have lost consciousness as being concussed. Patients may have had multiple concussions without having received treatment. No patient, unless new to the sport, should be treated as if this is their first concussion. Imaging to determine the presence of skull fracture or hemorrhage may be indicated. Patients with trauma in MMA are at risk for subarachnoid hemorrhaging. Computed tomography (CT) is typically required to rule out subarachnoid hemorrhaging.[9] Because CT machines are not available in most urgent care centers, patients for whom there is suspicion of hemorrhage or brain damage should be transported to an emergency department for imaging. Indications for transport include a score of <13 on the Glasgow Coma Scale, change in level of consciousness, loss of consciousness, comorbid bleeding disorders, severe headache, neural deficits, post-traumatic seizures, or apparent skull fracture or deformity.[10] For minor hemorrhaging, treatment should include monitoring the patient's level of consciousness and restriction from participation in contact sports until CT can confirm clearing of the hemorrhage. With any serious head injury, treat the injury as urgent and prepare the patient for transport to an emergency department. Loss of consciousness has a severe impact on the life of a fighter. A knockout will result in a medical suspension of a professional fighter for 60 to 180 days, with required physician follow-up, depending on the extent of the injury. Because participating in sanctioned fight is a professional fighter's career, this can be detrimental to the patient's income. Treating loss of consciousness in a fighter must be approached carefully: The patient must clearly understand the requirement to avoid participation in contact sports for a set amount of time. The Ultimate Fighting Championship often suggests 45 days without engaging in contact sports.[11] Obtain a score on the Glasgow Coma Scale to determine the extent of injury. Although symptomatic management is not typically indicated with a good score, be sure to inform the patient of the risks of going back to training early and of sustaining future concussions.[3]

Conclusion

MMA is an aggressive contact sport that makes injuries of many forms possible, from minor to career-ending. In the patient whose case is discussed here, there was more than one injury requiring evaluation for proper treatment. With patients who participate in MMA, it is important to keep in mind the mechanism of injuries so as to avoid overlooking less-obvious but more-severe injuries. In our patient, a neurologic deficit could have been overlooked because of the more clearly defined ankle injury. Keep in mind the facilities in which these seemingly healthy patients train, as well as the potential for sustaining underlying neurologic and skeletal complications. Because of the growing popularity of the sport, it has become crucial to understand the injury presentations and complications of those who practice MMA. These patients plan to continue training even after a major injury, so it is imperative that the treating urgent care physician instruct patients to schedule a follow-up examination with a primary-care provider and create clear instructions for patients before discharge about their level of activity and the complications of further injury. ■

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