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Case Report

Retained Intra-abdominal Rifle Cartridge in a Pediatric Patient

Pediatrik Bir Hastada Karın İçinde Kalan Tüfek Mermisi

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ABSTRACT

Firearms are the leading cause of death in children and adolescents in the United States, surpassing motor vehicle accidents. Gunshot wounds, specifically those of high-velocity firearms, are associated with catastrophic blast injuries to multiple organs and vasculature, leading to a high percentage of operative intervention. Occasionally, a bullet may miss all vital organs and become lodged in the body. In stable patients with retained bullets, as long as the bullet is not intraarticular, intrabursal, or in weight-bearing areas close to the skin, the management is usually to leave the bullet in place. However, recent research has found that this may leave patients at risk for long-term pain and psychological impacts. In this case report, we present a 13-year-old patient with a retained 30 mm intra-abdominal rifle cartridge. The patient presented 10 days following the injury in stable condition and underwent cartridge removal due to generalized weakness and vague pain. In surgery, the cartridge was incorporated into the omentum but otherwise freely was moving within the abdomen.

Keywords: *Retained bullet, gunshot, firearm, penetrating trauma, case report*

ÖZET

Amerika Birleşik Devletleri'nde ateşli silahlar, motorlu taşıt kazalarını geride bırakarak çocuklar ve ergenlerde başlıca ölüm nedenidir. Özellikle yüksek hızlı ateşli silahlarla meydana gelen kurşun yaralanmaları, birden fazla organ ve damar sisteminde yıkıcı patlama yaralanmaları ile ilişkilidir ve yüksek oranda cerrahi müdahale gerektirir. Bazen bir mermi tüm hayati organları ıskalayarak vücutta yerleşebilir. Stabil hastalarda, eğer mermi eklem içinde, bursa içinde veya deriye yakın ağırlık taşıyan bölgelerde değilse, genellikle merminin yerinde bırakılması tercih edilen bir yaklaşımdır. Ancak, son araştırmalar bu durumun hastaları uzun vadeli ağrı ve psikolojik etkiler açısından riske atabileceğini ortaya koymuştur. Bu olgu sunumunda, karın içinde kalan 30 mm'lik bir tüfek mermisine sahip 13 yaşında bir hasta rapor edilmiştir. Hasta, yaralanmadan 10 gün sonra stabil durumda başvurdu ve genel halsizlik ve belirsiz ağrı nedeniyle mermi çıkarma işlemi gerçekleştirildi. Cerrahi sırasında, merminin omentuma entegre olduğu, ancak diğer taraftan da karın içinde serbestçe hareket ettiği gözlendi.

Keywords: *Tutulan kurşun, ateşli silah, ateşli silah, penetran travma, olgu sunumu*

INTRODUCTION

Firearm injuries are the leading cause of death in children in the United States, resulting in over 1,500 deaths, 3,700 injuries and 20,000 emergency room visits annually (1,2). The majority of firearm injuries are due to assault (67%), which most commonly occur between the ages of 15-17 years old (2). Compared to other pe–

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netrating injuries, firearms are more likely to be associated with multiple organ injuries requiring surgical interventions and, subsequently, more postoperative complications. Bullets that cause less damage are more often from low-velocity firearms, such as pistol calibers (3). These wounds are often treated nonsurgically with local wound care (4). Occasionally, bullets miss vital organs and become embedded in muscle or soft tissue; it is assumed this is more likely to occur with lower-velocity firearms. Conversely, high-velocity firearms like rifles, with muzzle velocities over 2000 ft/s, are associated with more significant tissue damage that often requires surgery (3,4). There are almost no reported cases of retained rifle cartridges causing zero to minimal symptoms in patients. Management of retained bullets initially remains unclear; however, if not causing imminent harm, the bullet is generally left in situ. Retained bullets or fragments are more likely to be found in the extremities rather than the trunk. The most frequent indications for retained bullet removal after initial injury arise due to pain and palpable bullets (5). Individuals with retained bullets have higher rates of follow-up due to pain associated with bullet retention (6). Furthermore, studies specifically within the pediatric population have shown that up to 22% of children discharged with retained bullets will experience long-term complications related to the foreign body (5,6). Lastly, patients with retained bullets often tend to have higher rates of psychological conditions, including depression, anxiety, and post-traumatic stress disorder (5,6). This case report follows the unique presentation of a 13-year-old female with a retained rifle cartridge that was causing minimal symptoms. To our knowledge, there are almost no reported cases of the medical management of retained rifle cartridges in pediatric patients; this case aims to contribute to the data needed to aid in the implementation of standardized recommendations for proper management. Additionally, this case report details critical factors to look for in asymptomatic patients, which may necessitate removal of a bullet.

CASE REPORT

A 13-year-old female presented 10 days following a gunshot wound to the right upper quadrant. The patient's initial injury occurred outside of the United States, where she was monitored and discharged with a retained abdominal bullet and no intervention. Following her discharge, the patient traveled to the United States, where she began complaining of generalized weakness and discomfort at the site of the bullet wound in the right upper quadrant. The patient denied nausea, vomiting, fever, chills or shortness of breath, and was eating normally. Vitals and labs were within normal limits. On physical exam, she had a small, less than 1 cm penetrating wound that appeared to be healing well in the midclavicular region of the right upper quadrant at the level of the costal margin. She had mild tenderness over the wound but no erythema, drainage, fluctuance or crepitus in the wound. Computed tomography (CT) scans were obtained of the abdomen and pelvis, and showed a small amount of free fluid in the pelvis, as well as a left upper quadrant foreign metallic bullet-shaped foreign object (Figures 1 and 2), but no signs of acute injury otherwise. CT of the chest did not show any evidence of acute injury. Given the location of the bullet and her symptoms, she underwent a diagnostic laparoscopy to assess for missed injury and potential removal of the projectile. She was found to have a small area of bruising to the proximal small bowel without evidence of full-thickness injury or bile leakage, superficial blast injury to the posterior stomach, and a small hemostatic capsular tear over the right lobe of the liver. The spleen, diaphragm and all other intra-abdominal organs were visualized without signs of injury. The bullet was not easily identified in the right upper quadrant, so on-table fluoroscopy was used to identify the location of the bullet, which showed it had migrated to the left mid-abdomen (Figure 3). Ultimately, it was found to be encased in the omentum but unattached to any other abdominal structures, allowing for free mobility within the abdomen. The 30 mm cartridge was then removed with the attached omentum using a harmonic scalpel. One day following surgery, the patient was ambulating, tolerating diet, and was in minimal postoperative pain with a resolution of her previous discomfort. She was discharged the following morning and reported resolution of her symptoms on follow-up. The informed consent of the patient's parents was obtained for this case study.

Figure 1. Axial view of CT scan with bullet-shaped 30mm metallic fragment within the left lower quadrant abdomen

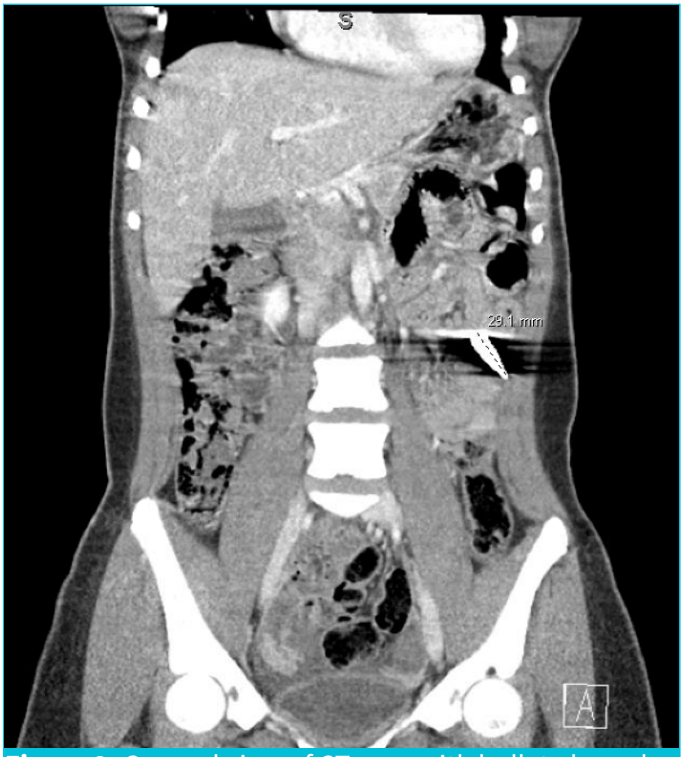

Figure 2. Coronal view of CT scan with bullet-shaped 30 mm metallic fragment within the left lower quadrant abdomen

DISCUSSION

This unique case follows the surgical treatment of a 13-year-old female with a retained bullet. She presented 10 days following a high-velocity gunshot wound to the abdomen, as evidenced by a retained 30 mm intra-abdominal cartridge. Her persistent abdominal discomfort and generalized weakness were attributed to this retained object as her appetite and symptoms improved following removal. The uniqueness in her case was both her initial trauma presentation and the location of the retained bullet on exploration.

It is relatively uncommon for transabdominal high-velocity gunshot wound victims to be in stable condition and have no initial surgical intervention (7). While the literature has demonstrated conservative management of abdominal gunshot wounds when the patients are hemodynamically stable, the effects of the retained bullets are still not fully known and variable based on each patient (8). This patient survived the initial injury despite the high-velocity weapon, likely due to the mechanism of injury as she was shot from a distance from a moving vehicle that may have slowed down the impact if it ricocheted before entering her abdomen.

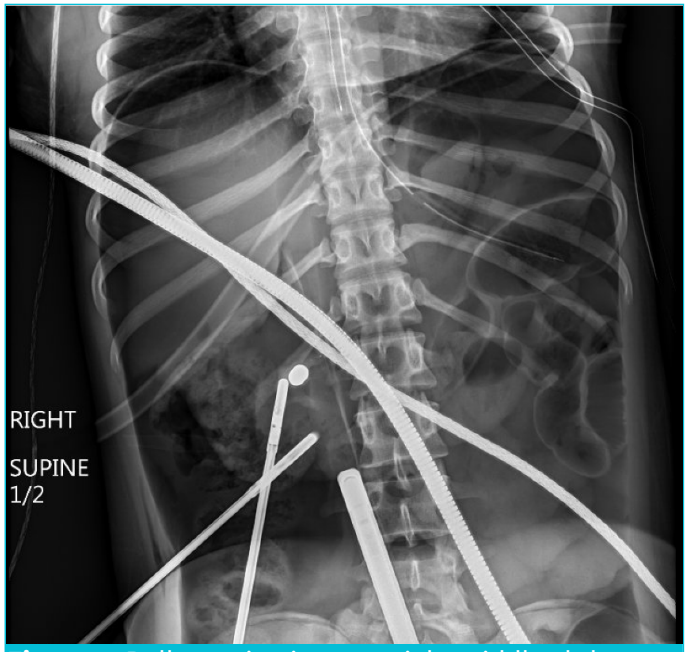

Figure 3. Bullet projecting over right middle abdomen with laparoscopic instruments projecting over the field and pneumoperitoneum from active laparoscopic surgery at time of image

In victims of gunshot wounds, the type of fire-arm is extremely crucial as it contributes to the severity of damage (9). High-velocity firearms are defined as having a muzzle velocity greater than 2000 ft/s. These tend to be rifle calibers and will cause considerably greater injury than a low-velocity fire-arm, defined as a muzzle velocity less than 2000 ft/s, such as a pistol caliber (9). In this case, the victim was shot with a high-velocity fire-arm, which aids the rarity of her presentation. Additionally, the majority of retained bullets are found in the extremities, as bullets in the chest or abdomen have an increased risk of hitting vital organs, necessitating emergent surgery (5). Bullets that impact the extremities over the abdomen or chest are more likely to come into contact with soft tissue and muscle, which can be observed if they do not cause any pain

(10). Although management of retained bullets is determined on a case-by-case basis, patients returning with palpable bullets or bullets causing new pain are recommended to receive removal of the bullet, no matter the location (10). Although this patient was shot in the abdomen, another aspect of this case's uniqueness is that the bullet was retained freely in the intraperitoneal cavity. The free mobility within the peritoneal cavity is most likely attributed to this patient's vague symptoms. The challenge in her case was identifying the location of the retained bullet as it was clearly visible on the CT scan but mobile within the abdomen on fluoroscopy. Using laparoscopy and adjuvant imaging intraoperatively allowed for a minimally invasive way to successfully locate and remove the projectile. A key point to this case is that this bullet traveled within the intraperitoneal cavity between imaging and surgery. Thus, while this patient had minimal symptoms, the mobility of the bullet put her at risk for additional severe organ or vessel damage. Initial imaging is always a requirement for trauma victims with gunshot wounds, and in stable patients in which bullets are left, it is helpful to compare imaging over time to ensure the bullet remains in place (11,12).

Overall, there is difficulty in determining who will have complications of retained bullets, and management is often specific to each patient. Some studies suggest increased return emergency department visits, psychological stress and pain are present in both pediatric and adult patients following retained bullets (5,6,13). With the long-term clinical and psychological impact unclear, additional data should be collected to create standardized recommendations on the management of retained bullets in the pediatric population. Regardless of symptomatology, in patients with retained bullets, it is critical to determine the location and possibility for mobility of the bullet. This patient's bullet was mobile within the intraperitoneal cavity, causing increased difficulty during surgery in finding the bullet and increased risk of further damage. Although the management of retained bullets is often determined on a case-by-case basis, significant factors to consider are the presence of pain, the location of the bullet, and the potential for mobility. A thorough physical exam and history are paramount in determining the best treatment plan for the patient.

Patient Consent Form / Hasta Onam Formu

The parents' of this patient consent was obtained for this study.

Conflict of Interest / Çıkar Çatışması

The authors declared no conflicts of interest with respect to authorship and/or publication of the article.

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