

CASE REPORT

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Ballistic trauma of the cervical spine: About a case and review of the literature

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ABSTRACT

Introduction: Ballistic trauma is the consequence of the penetration into the body of a projectile (bullet, lead, metal fragment) coming from the envelope or the contents of an explosive device.

Case Report: We report the case of a 16-year-old patient with no particular pathological history that we had received for a ballistic trauma to the upper cervical spine that occurred in Conakry. The neurological examination was normal. Cranio-cervical imaging revealed the presence of a projectile at the level of the left condylo-atloid joint with fracture of the internal cortex of the ipsilateral condyle. The aim of the surgery consisted of a laminectomy associated with removal of the projectile and exploration for vascular complications and osteomeningeal breaches. The operative consequences were simple.

Conclusion: Ballistic trauma is a complex, infrequent but serious clinical entity. Their management must obey a well-codified strategy.

Keywords: Ballistic, Penetrating trauma, Projectile

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INTRODUCTION

Ballistic trauma results from the penetration into the body of a projectile (bullet, lead, metal fragment) from the envelope or contents of an explosive device [1]. They can even occur outside of the circumstances of war. Adolescents and young adults from the most disadvantaged social strata are those who pay the heaviest price [2]. We report a case of cervical ballistic trauma by firearm with an entry port on the left posterolateral face of the neck.

CASE REPORT

We report the case of a 16-year-old patient from Guinea (Conakry), with no particular pathological history residing in the Medina that we had received two (02) months from a ballistic trauma of the upper cervical spine that occurred in Guinea Conakry. She allegedly received a projectile (gun bullet) in her home during an armed attack in her neighborhood at around 4 a.m. She presented with stiff neck with no other associated signs. The general examination revealed: a general satisfactory condition, skin and mucous membranes well colored, no edema of the lower limbs, nor folds of dehydration. The weight was 45 kg, the height 1.50 meters, the temperature 37.1 °C, the frequency: 90 beats/min, and the respiratory rate: 22 cycles/min. On neurological examination: walking was normal, there were no sensory-motor deficits nor genito-sphincter disorders. Examination of the spine revealed kyphosis of the cervical spine with contraction of the para-vertebral muscles on palpation. At the cephalic end, we noted the presence of a wound in the process of vertical healing, about 5 cm long, located at the level of the left posterolateral face of the neck, corresponding to the entry orifice of the projectile (Figure 1). The blood crisis

was normal. The standard cranio-cervical radiography had objectified the presence of a projectile at the level of the occipito-atloid joint (Figure 2). Cranio-cervical computed tomography which revealed the presence of a projectile at the level of the left occipito-atloid joint with fracture of the internal cortical bone of the ipsilateral condyle (Figure 3). The aim of the surgery consisted of a cervical laminectomy associated with a withdrawal of the projectile (Figure 4) at the level of the condylo-atloid junction and an exploration in search of vascular complications (damage to the vertebral artery) and osteomeningeal breaches (dural lesion) that we had not detected during the operation. Wearing a C4 collar for a minimum of 3 or 4 months was associated. Postoperative parenteral treatment with amoxicillin-clavulanic acid (1 g × 2/d in direct intravenous (IVD)), hydrocortisone hemisuccinate (100 mg × 2/d in IVD= direct intravenous) and analgesics at a rate of 60 mg/kg weight divided into

four doses are prescribed for four days, with an oral relay for eight days. The operative consequences were simple. The operative outcome was simple. The patient was seen again one month after surgery without any clinical particularity.



Figure 1: Healing wound on the left posterolateral side of the neck (white arrow).

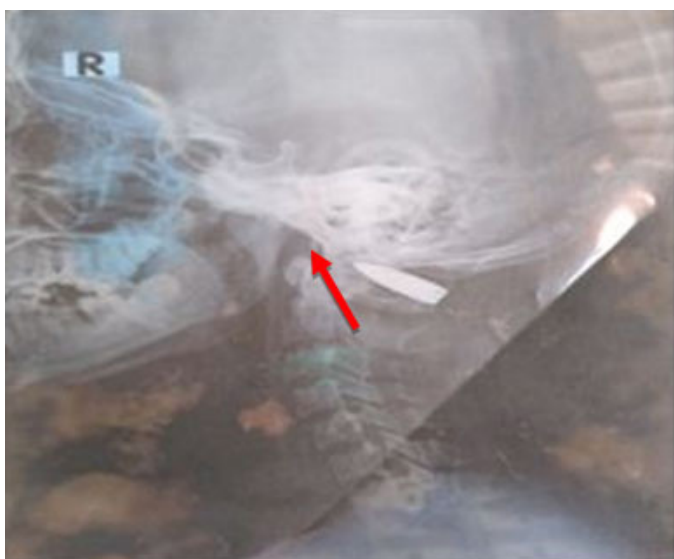


Figure 2: Standard cranio-cervical X-ray showing the presence of a projectile at the level of the occipito-atloid joint (red arrow).

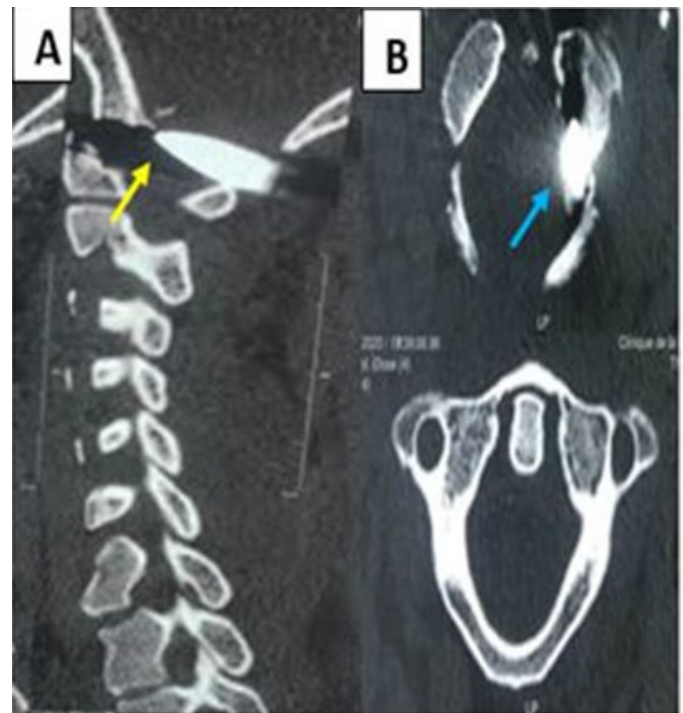


Figure 3: Cervical CT scan, (A) axial slice, (B) sagittal reconstruction: showing the presence of a projectile at the level of the left occipito-atloid joint with fracture of the internal cortex of the ipsilateral condyle (yellow and blue arrow).

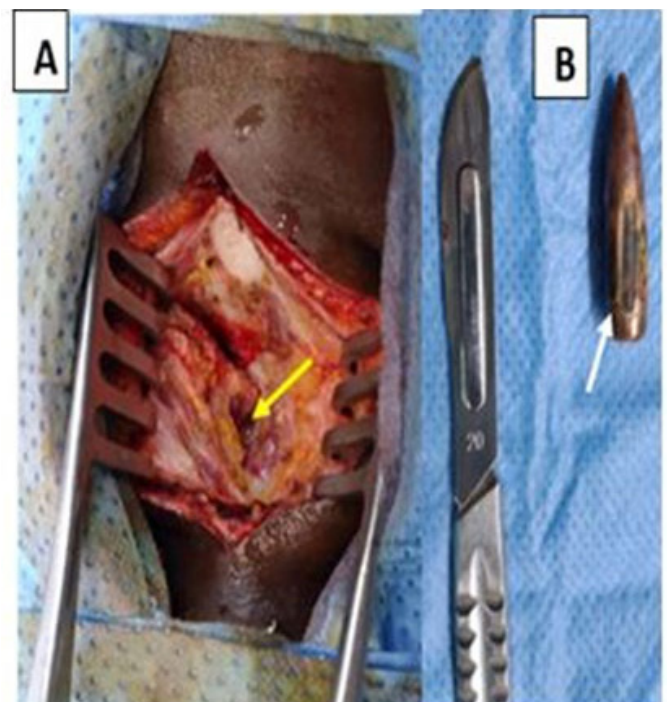


Figure 4: (A) Intra-operative image after extraction of the projectile showing the path of the projectile (yellow arrow); (B) Image of the projectile after removal of the ipsilateral condyle (white arrow).

DISCUSSION

With the increase in violence around the world, the incidence of spinal gunshot wounds continues to increase among the civilian population. Among these injuries to the spine, that of the cervical column is the most devastating [3]. No physical theory can predict with certainty the behavior of a projectile in the human body [1, 4]. However, it is important for any surgeon to understand the basics of ballistics. Indeed, knowing the trajectory of the bullet and its final location makes it possible to consider potential lesions and assess the patient's management [5]. The first peculiarity of the case we are reporting lies in this atypical trajectory of the bullet: after the posterolateral part of the neck, the projectile ends at the level of the condylo-atloid joint. This could be related to the long distance of the shot, to the trajectory of the bullet with a low relative velocity of the projectile during contact with the patient. Indeed, the speed of the projectile decreases with the distance because of the resistance of the air to its progression [1]. The second feature is the absence of life-threatening lesions (vascular, nervous, and visceral) during bullet migration in this patient. Gun injuries vary depending on the nature of the projectile, muzzle velocity, distance, and the part of the body involved [4, 5]. The superficial location of the internal carotid makes it more vulnerable to trauma; unlike the vertebral arteries which are relatively protected by their location in the foramen [6]. In our case there was no vasculo-nervous lesion. The AK-47 Kalashnikov rifle fires a 7.62 mm bullet at supersonic speed with a maximum range of 200 m. Its injurious power is important, potentially deadly [1, 7]. As in our observation, our patient performed imaging, namely the standard cranio-cervical X-ray and the tom densitometry of the cervical spine. The realization of the computed tomography (CT) angiography would make it possible to appreciate the relations of the projectile with the vessels (vertebral artery), which we had not realized in our study. The management of trauma by fire arm remains controversial and the decision to operate remains difficult, especially in cases of incomplete neurological deficit. For most of the authors, the extraction of the projectile in emergency or the decompressive laminectomy is not advised, because not only it would not improve the neurological results, nor the risk of infection, with or without associated lesion [8–10], but there is rather a risk of neurological aggravation. Surgery is not recommended if neurological deficit is incomplete [8]. According to some authors, ballistic spinal cord trauma (by firearm) only requires surgery in 4.3% of cases [11]. Only cases of vertebral-medullary trauma with a high risk of contamination by involvement of a hollow viscus or a potential vascular injury require surgical exploration. The objective of the surgery is not the extraction of the projectile, it is indicated in the following cases [11, 12]:

- Severe instability,
- progressive secondary post-traumatic kyphosis,
- root canal obstruction,

- secondary aggravation of a neurological deficit,
- projectile migration.

In our study, the patient was non-deficient and the objective of the surgery was the removal of the projectile at the level of the condylo-atloid junction and the exploration for vascular complications (damage to the vertebral artery) and breaches, osteomeningeal (dural lesion). An immobilization by corset may be necessary postoperatively as in our case. In the event of bi-pedicle or bi-face involvement, secondary instability is possible and may require fixation [11]. In our case there was no joint injury. Perforation of a hollow viscus increases the risk of infection [8]. This risk is increased when the projectile passes through the viscera before reaching the rachis. It may be meningitis or paravertebral infection [8, 13, 14], which we did not find in our study. Some authors therefore recommend antibiotic prophylaxis for at least 7 to 14 days when the projectile has passed through viscera before the vertebral-medullary attack [9, 12]. Corticosteroid therapy is not recommended because it would have no effect on the spinal cord injury, when it is below the spinal cord, and its use remains controversial when the injury is spinal [11]. For some authors [15–17] it is in any case inappropriate; it could increase the risk of infection. In our study, no visceral involvement or infection, but we did antibiotic prophylaxis and corticosteroid therapy for short periods after the operation. The realization of a control scanner could be useful to us but it was not carried out in our case for lack of means.

CONCLUSION

Ballistic trauma is a complex, infrequent but serious clinical entity. Therefore, the management must obey a well-codified strategy: (a) evaluation of the patient with a view to determining an associated visceral or vascular lesion for prompt management; (b) neurological assessment after hemodynamic stabilization in order to prioritize patients, knowing that thoracic lesions are the most frequent and the most serious and that cervical lesions are the rarest but the most fatal; (c) neuroradiological assessment; (d) surgery must be delayed due to the urgency of the visceral lesion. The above points were commended systematic antibiotic prophylaxis in our working conditions.

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Author Contributions

Donzo Ansoumane – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related

to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Cisse Yakhya – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Ndiaye Moustapha – Design of the work, Acquisition of data, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Adjamou Amidou – Conception of the work, Design of the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Jean Michel Nzisabira – Conception of the work, Design of the work, Drafting the work, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Guarantor of Submission

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Consent Statement

Written informed consent was obtained from the patient for publication of this article.

Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.

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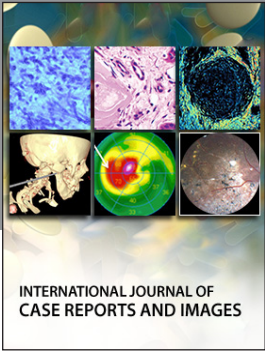
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