

A Review of Arrow Shot Injuries to the Head and Neck in Northeastern Nigeria

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ABSTRACT

Background: Arrow shot injuries remained rampant in developing countries. Involvement of the head and neck region is not uncommon and poses a significant management challenge due to the presence of so many vital structures within a relatively small anatomic region. **Objective:** To review the pattern of arrow shot injuries to the head and neck region that presented to the University of Maiduguri Teaching Hospital (UMTH) in Northeastern Nigeria. **Method:** This is a retrospective review of patients who presented with arrow shot injuries involving the head and neck region, to the University of Maiduguri Teaching Hospital, Maiduguri, Borno State, Nigeria between January 2009 and December 2019. **Result:** All the thirty patients studied were males. The mean age was 32.2±SD14.4 (range 8-60 years), the peak age group affected was 11-20 years. The majority (83.4%) are 40 years and below. The main reasons for the attacks were terrorism due to Boko haram (40%), cattle rustling (30%), and herdsmen/farmers clashes (20%). Affected sites were the neck (46.7%), the orbit (20%), and the nose (10%). Patient had wound exploration and arrow extraction, debridement, evisceration of the globe, fronto-ethmoidectomy, medial maxillectomy, and vascular repair as the case may be. **Conclusion:** Arrow shot injuries still exist in our society and may involve the head and neck region leading to significant management challenges. Priority should be given to adequate resuscitation and airway management especially in unstable patients. Appropriate and timely intervention is necessary for a good outcome.

Key words: Arrow shot, head and neck region, Boko haram, penetrating neck injury

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Introduction

Arrow shot injuries are uncommon in developed countries.¹ However, when they do occur, they are mostly suicidal attempts using the crossbow.² But such injuries are still being reported in developing countries.^{3,4,5} Involvement of the head and neck regions are not uncommon. Arrow shot injuries constitute 0.1% of emergency admissions in developing countries.⁶ Up to 15.3% of arrow shot injuries involve the head and neck.³ In Nigeria, especially the northern part of the country, arrows are used as weapons during inter-communal clashes, cattle rustling, and terrorist activities. Arrows are low-velocity projectiles causing penetrating injuries, especially at close range. They generally have a less damaging effect than high-velocity projectiles. Arrows are made up of metallic tips mounted on a wooden shaft. There are two main types of arrow tips, the conical field tip which is commonly used to practice shooting and causes less tissue damage, and a broad head tip which is edged and barbed and design to cause more tissue damage and are more



difficult to remove surgically.^{3,7} Injuries ranged from non-fatal soft tissue injuries to life-threatening injuries especially when vascular, aerodigestive, and neurological structures are involved. The severity of the injury depends on the distance of the assailants from the victim, the fork and trajectory of the arrow, and the physical characteristics of the arrow.⁸ Tissue injury is caused by the penetrating force of the extremely sharp cutting edge of the arrowhead limiting the injury to the tissues that are directly incised by the blade of the arrowhead.⁹

The Grant and Ebstein classification provide the basis for an organized approach to the management of penetrating facial trauma.¹⁰ The system divides the face into entry zone I, II, and III. Zone I include the forehead and ears, it is bounded superiorly by the hairline and inferiorly by the supraorbital rim. Zone II is the midface, it includes an area from the supra-orbital ridge down to the upper lip and laterally to the preauricular area. Zone III extends from the lower lip to the level of the hyoid bone.

Penetrating neck injury describes trauma to the neck that has breached the platysma muscle and represents 5-10% of all trauma cases.^{11,12} The common mechanisms of injury worldwide are stab wounds, gunshot wounds, self-harm, road traffic accidents, and other high-velocity objects.^{13,14} Penetrating neck injuries are classified into the three anatomical zones of the neck based on the site of penetration as described by Roon and Christensen.¹⁵ Zone I extend from the clavicle to the cricoid cartilage. Zone II extends from the cricoid cartilage to the angle of the mandible and Zone III, from the angle of the mandible to the base of the skull.

The study reviewed the pattern of arrow shot injuries to the head and neck managed in the University of Maiduguri Teaching Hospital.

Method

The study was a retrospective review of patients with arrow shot injuries to the head and neck region managed at the ENT Surgery Department of University of Maiduguri Teaching Hospital,

Maiduguri, Borno State, North-Eastern Nigeria, over 10 years (2009- 2019). UMTH is the major tertiary institution in the region with a 530-bed capacity, received referrals from all states in the region and neighbouring countries of Niger Republic, Chad, and Cameroon. Relevant information including the age, sex, site of entry, reason(s) for the attack, complication(s) at the time of presentation, method(s) used to extract the arrow, and other procedure(s) performed on the patient and outcome after treatment were extracted from the patients' case notes and operating theatre register. Data extracted were analysed using SPSS version 16. Ethical clearance was obtained from the hospital's ethical committee.

Results

A total of 30 cases of arrow shot injuries to the head and neck region were reviewed. All were males, with ages ranging between 8 and 60 years, and a mean of $32.2 \pm SD14.4$. The age group most commonly affected was 11-20 years. Twenty-five (83.4%) of the victims were 40 years and below (Table 1). The main reasons for the attack were terrorism-related 12 (40%), cattle rustling 9 (30%) and farmers/herdsmen clash 6 (20%) (Table 2). The sites involved in the head and neck were the neck 14 (46.7%), eyes 6 (20.0%), nose 3 (10.0%) (Table 3). Nine (64.3%) out of the neck injuries involve zone II, and 3 (21.4%) and 2 (14.3%) involved zone I and III respectively. Complications encountered at the time of presentation include upper airway obstruction 6 (20%), visual loss 6 (20%), cranial nerve palsy 2 (0.07%), and haemodynamic instability 2 (0.07%). All cases presented with the arrow in-situ and had wound exploration. Procedures performed include arrow extraction, debridement and tracheostomy (6), vascular repair (3), evisceration (6), external fronto-ethmoidectomy (2), and medial maxillectomy (2) (Table 5). Two mortalities were recorded, and all were due to exsanguinating haemorrhage from the involvement of the common carotid artery.



Table 1: Distribution by age group

Age (years)	Frequency (Number)	Percent (%)
≤10	1	3.3
11-20	11	36.7
21-30	8	26.7
31-40	5	16.7
41-50	4	13.3
>50	1	3.3
Total	30	100

Table 2: Reasons for the attack

Reasons for attack	Frequency (Number)	Percent (%)
Cattle rustling	9	30
Farmers-herdsmen clash	6	20
fight over women	3	10
Terrorist attack	12	40
Total	30	100

Table 3: Site of entry

Site involved	Frequency (Number)	Percent (%)
Neck	14	46.7
Orbit	6	20.0
Temporal region	2	6.7
Malar region	3	10.0
Frontal region	2	6.7
Nose	3	10.0
Total	30	100

Table 4: Operative procedures performed

Procedure performed	Frequency (Number)
Extraction, debridement and repair	30
Extraction and tracheotomy	4
Extraction and vascular repair	10
Extraction and evisceration	6
Extraction and fronto-ethmoidectomy	2
Extraction and medial maxillectomy	2





Figure 1; Preoperative pictures



Figure 2; Intraoperative pictures

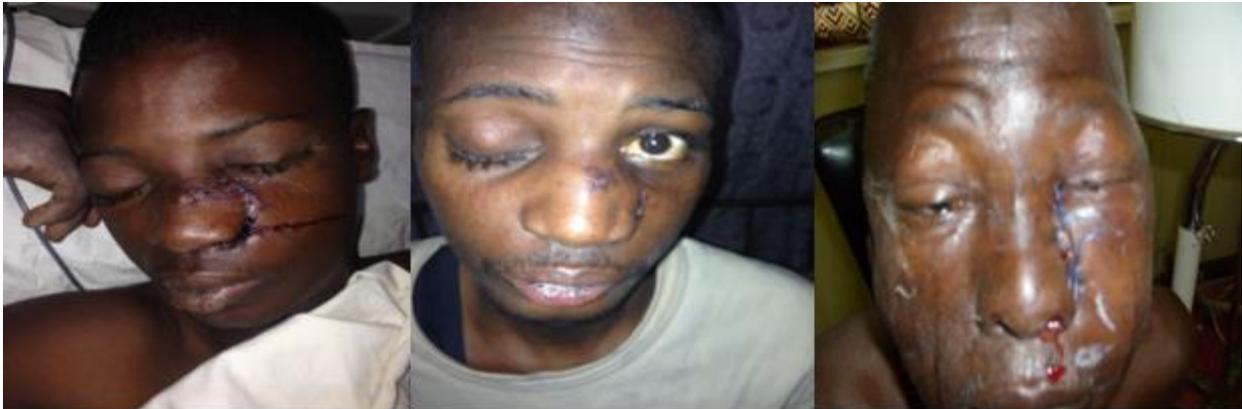


Figure 3; Postoperative pictures



Figure 4: Removed arrows



Figure 5; Plane X-ray of the skull showing arrow in place

Discussion

Arrow shot injuries are uncommon in the developed world, however it is not uncommon in the developing countries. We reviewed 30 cases of arrow shot injuries to the head and neck, over a 10-year period. This is less than the finding by Aliyu et al³ who reported 9 head and neck injuries in 2 years. Like previous studies,^{16,17} arrow shot injuries were exclusively seen in males. This contrasts with the report by Aliyu et al³ who found 2 (6.1%) out of the 33 cases to be females, with a male-female ratio of 15:1. Most of the patients fall within the age 11-20 years constituting 36.7% similar to what Aliyu et al³ reported. However, Na'aya et al¹⁷ documented involvement of older age group than ours (21-30 years). Overall, we found that 83.3% of the patients are 40 years or below. This is similar to the findings by Aliyu et al.³ This may be explained by the fact that those aged ≤40 years are the most active, economically vibrant, and socially dynamic members of society and are most likely to be exposed to violence.

Various reasons have been attributed to the cause of arrow shot injuries in different societies, ranging from socio-political and economic conflict or accidental.^{5,15,18} Aliyu et al³ found herdsmen/farmers clash, cattle rustling, and communal clashes as the main cause of arrow shot injuries, accounting for 51.51%, 21.21%, and 15.15% respectively. However, Na'aya et al¹⁷ documented herdsmen/farmers clashes, armed banditry, and fighting over women as the main reason for arrow shot injuries accounting for 43.9%, 29.8%, and 17.5% respectively. The main causes of arrow shot injuries in this study were terrorist attacks, cattle rustling, herdsmen/farmers clashes, and fighting over women accounting for 40%, 30%, 20%, and 10% respectively. The majority of arrow shot injuries in this study resulted from terrorist attacks, in contrast, to report from other studies^{3,17} where herdsmen/farmers clash was the main cause. This is due to the Boko haram terrorist activities in North-Eastern Nigeria and the decline in economic activities such as farming and cattle rearing.

Most of the injuries encountered involved the soft tissues of the head and neck because arrow shots are low-velocity missiles. Although some of the patients have involvement of deeper structures, this may be due to the short distance between the assailants and their victims. We found involvement of the head

(53.3%) to be slightly more than that of the neck (46.7%). This may be because the head is more prominent and usually targeted for shooting. Structures in the mid-face were commonly involved (75%), these include the eye (37.5%), nose (18.8%), and the malar area (18.8%). Martin et al¹ found that 61.9% of penetrating facial trauma was in the midface with ocular involvement in 38%. Lawan et al²⁰ reported two cases of arrow shot injuries to the globe with associated complete loss of vision similar to the finding in this study. Martin et al¹⁹ reported 3 cases of area I maxillofacial injury, two of which involved intracranial penetration, though the mechanism of injury differs from that of our study. We found zone II injury to be the commonest (64.3%). This was similar to a report by Mahmoodie et al²¹ who demonstrated that zone II was commonly involved in penetrating trauma. This may be because zone II is the most exposed and unprotected and thus more susceptible to trauma. The most commonly injured structure in the neck found in this study was muscles and vascular structures (57.1%) followed by laryngotracheal injuries (28.6%) and pharyngo-oesophageal injuries (14.3%). A study on 192 cases of penetrating neck trauma reported the most commonly injured structures in the neck were the vessels (67.2%), followed by the laryngotracheal region (24.9%) and pharynx (8.2%).¹⁹ The difference may be due to the mechanism of injury. In the above study the mechanism of injury was commonly stab injury, while in our case, it was from arrow shot injuries.

In our study, all patients had wound exploration as the arrows were in situ at presentation and therefore must be removed. Patients had wound exploration, arrow extraction, debridement, and primary closure with drainage. Other procedures performed as indicated were vascular repair, tracheostomy, fronto-ethmoidectomy, medial maxillectomy, and evisceration. There were reports of arrow shot injuries to the skull base²², the eye²⁰, and the neck requiring procedures like medial maxillectomy, evisceration, and vascular repair. Arrows were left in situ and stabilized as some may have a tamponade effect, this reduces chances of injury to surrounding structures until the patient reaches the theatre. Removal was done under general anaesthesia careful dissection was carried out to prevent removal catastrophe. O'Neill et al.²³ suggest the removal of



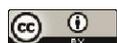
arrows with barbs in an anterograde direction along the line of its trajectory to avoid further injury to blood vessels and other structures. We recorded 6.7% mortality in our study. The two patients that died were unstable at presentation due to profuse bleeding from vascular injury and had cardiac arrest and died during resuscitation. Mohanty et al recorded 7.7% mortality in 13 patients with arrow shot injuries, with the mortality resulting from haemorrhagic shock, septicemia, pneumonia, and respiratory failure.⁶

Conclusion

Arrow shot injuries of the head and neck still exist in our society and are associated with significant management challenges even in the best of hands, Prompt and early intervention remains key to reducing mortality.

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