

Case Report

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Penetrating Facial Injuries from Angle Grinder Use-Cases Report, Experience



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Abstract

Injuries resulting from the improper use of angle grinders are numerous in head in neck area, craniofacial injuries are, the most common sites injured. The results of impact between the disk moving with very high speed and the skull, are penetrating, disfiguring even fatal open injuries ,but depending on the kinetic energy and trajectory of the object. A series of 2 patients with penetrating facial wounds associated with angle grinder with the same location are presented. Also both patients were unexperienced users of an angle grinder ,they didn't read the manual, also both of them they choose an inappropriate disk for what they try to cut ,plus in one case the disk was already broken. Non of them use protective goggles, casket or a face mask and both of them they remove the protecting guard of the disk, being supervised by relatives or neighbours. Even they have the almost the same laceration in the same area the same size there is a great difference of attitude and gravity between them [1].

One presents with an inserted foreign body-the disk remain stuck in the maxillary bone, the second one was more severe because the disk penetrate more in the viscera cranium 3cm, enough to transect the orbit and compromise the eye. The purpose of this article is not only to present rare, shocking cases but to try to offer the correct attitude in front of a penetrating foreign bodies in the face also the best methods to repair a facial laceration hopping the best aesthetical result. The second case put the problem of mutilation impossible to repair- loss of an eye [2]. As a good doctor you have to face it to explain to the patient and the family, ask for help to a specialised ophthalmologist, who will relive you for such a burden. Don't forget to discuss the aesthetic future repair, with a good prosthesis even the function is lost Offer as much information you can, also don't forget about psychological support. Finally the paper work want's to insist for the patient in prevention, the importance to be informed , protected , careful if they need to use an instrument like an angle grinder.

Keywords: Angle Grinder; Occupational/Professional Accident; Penetrating Facial Injury; Impacted Foreign Body

Introduction

Angle grinders are tools frequent used at home or at work, capable to cut metal, concrete and stones. Injuries resulting from their use are numerous. The most common sites injured are the head and face. The Home and Leisure Accident Surveillance Systems (HASS/LASS) showed that angle grinders were third in their top ten list of most dangerous tools, to cut stone, metal and concrete. Penetrating head injury from angle grinders is increasingly recognized due to their frequent use in the work place and at home. With an average of 540 injuries recorded yearly during 3 consecutive years 2012-2014 in our hospital. The increasing number of recorded angle grinder injuries is alarming [2-24] (Table 1). Most frequent it's an occupational accident unexpected causing injuries in one or more workers—all men .Almost in every case the device was used by an unexperienced person or the disk choose for the job was improper or already used .Also in every case the protective part was removed because it covers the working place ,For sure no one wear protection like, casket, facial mask or goggles. Almost a half of the patients were on the influence of alcohol (Figure 1).

Table 1

Craniofacial Injuries In Scju Sf Apostol Andrei Constanta			
Year	Other causes	Angle grinder injuries	Total
2012	7694	540	8234
2013	10567	1237	11814
2014	11700	1568	13268



Figure 1: Angle rider complete tool.

A lot's of traumas are minor superficial or the laceration can be linear but profound. Most are severe injuries because of deep penetration of the disk with destruction of the facial skeleton but also of the soft tissues with mutilation .In some cases the disk can destroy the orbit and the content or can penetrate endocranial with neurological damages [3]. The high speed disc of angle grinders does not respect anatomical boundaries or structures and thus the injuries produced can be disfiguring also there is a high risk for eyes ,a disorganization complete of the eye requires orbital exenterating. Another characteristic for angle grinders laceration is that the vast majority are associated with foreign body penetration following shattering of the abrasive wheel. The patient must be rushed to the nearby healthcare centre .The most important thing is not to remove the impacted foreign body at the site of accident ,just try to stop the bleeding with a compressive bandage or even packing the wound. The patient can be in traumatic, haemorrhagic shock so must be stabilized with saline, plasma, analgesics, steroids, O2 on the mask or incubated in respiratory distress [4]. At the hospital after a CT scan, the lesions are evaluated so usually a team is required for the best repair including ENT surgeon, Ophthalmologist, Neurosurgeon ,OMF surgeon, An inserted foreign body requires first a CT scan to see the deepest position, ex if penetrate trough the posterior wall of the maxillary sinus ,severe haemorrhage can start from the internal maxillary artery. We can prevent this with an AngioCT embolization or preventive ligation of the ECA. Another problem is endocranial penetration [5]. Always extraction must start with, debridement around the foreign body and removal without zigzag motion needed. Removal should be done following original direction of projectile injury. The best aesthetically pleasing results can be achieved if we clean perfect the wound with saline, peroxide to remove all foreign bodies, fragments from the disk, fragments of dirt ,concrete etc. The sinuses involved must be cleaned—from blood, fragments of bones ,teeth's ,foreign bodies like fragments of the disk, metal, dirt or concrete ,remove nonviable mucosa removed ,than after we wash out the cavity with saline ,we place inside an antibiotic and and a drain, The facial bones some time require reduction, reconstruction Osteosynthesis of the maxilla, mandible, orbits or nasal pyramid ,rare the frontal bone. And in the end resection of wound edges and careful layered closure of the soft tissues [6-10].

Case report

Our first case, a 77-year-old right-handed male, without any significant past medical history, was brought to the emergency room for a cranio facial opened trauma with a foreign body penetrated and fixed in the right hemiface in the maxilla-suborbital area. The patient was injured at home when he was using an angle grinder to cut a metal object .The patient was an experienced mechanic but a few negative superposed factors were present. The causes of the severe impact between the disk and hemi right face of the patient were- the disk was not the one necessary for metal, was a little bit chopped. The

experience of our patient made him negligent, too sure about his skills, forgetting the age, plus the protection required .Not only that he remove the guard of the angle grinder but he neglect to wear a casket with facial mask or goggles, gloves. Plus was under influence of alcohol [11] (Figure 2).



Figure 2: The patient present a foreign body ,an angle grinder ,s disk inserted in the cheek ,penetrating the anterior wall of the maxillary right sinus with a deep laceration on the suborbital area without involving the eye.

On examination he was hemodynamically stable and maintaining adequate saturation with O2 on the mask. He was also conscious and responding to all the questions, he relate us what's happens and he was very curious how will we remove the foreign body-a part of the disk. Both pupils were equally reacting to light. There was no focal or lateralizing neurological deficit or evidence of seizure episode [12-14] (Figure 3). Patient profile view The patient present an almost linear vertical open wound on the right side of his face and suborbital area, and a disk was inserted and remained fixed. A lots of persons try to remove it ,from the patient ,relatives ,paramedics always a big mistake Only after an CTs can of the cranium-cerebral plus massive facial we can evaluate the extension of destruction ,how deep is inserted the foreign body and if penetration is dangerous-posterior wall with pterigo-maxillary fossa damaged-high risk of bleeding -if the internal maxillary artery is punctured or risk of infection.. Inside the sinus fragments from the abrasive wheel also metal dust and particles are visible Under general anaesthesia in the operative room we explore and repair the wound [15-17]. First the foreign body was removed without problems next the wound was debrided, carefully clean, small foreign bodies removed with a forceps or a currette and wash-out with saline or peroxide the maxillary sinus was cleaned, removing the foreign bodies inside and detached mucosa. Only the anterior wall was affected but without important damages, the orbit was intact but superior alveolar ridge was also cut in the same way, vertical, linear, than the wound was closed in layers [18] (Figure 4). We admit him in the ICU and we continue the treatment already start pre and intraoperative with antibiotics, analgesics, sustaining of the vital functions. Local we clean the wound and change the dressing every day. We remove the drain from the sinus on the 5-th day. He recovered well post operatively and was discharged from the

clinic 10 days later. After a month the healing was complete with a linear clean scar without functional permanent lesions.



Figure 3: The patient present a foreign body ,an angle grinder ,s disk inserted in the check ,penetrating the anterior wall of the maxillary right sinus with a deep laceration on the suborbital area without involving the eye.



Figure 4: The foreign body –part of disk who remained inserted in the face in fact with penetration in the maxillary sinus.

Case 2

A much younger patient, 35-year-old, right-handed, healthy male, without any significant medical past, normotensive, was brought to the emergency room following an occupational accident. With an angle grinder –at home he intent to cut a concrete wall. He recognise that was the first time when was using the new device .Not only he was inexperienced but he didn't read the instruction carefully and he was not sure if the disk was the good one or if it was proper fixed. Also he neglect to wear protective goggles, gloves even were there new [19]. He ask the help from his neighbour, more experienced ,but this was another bad idea because the neighbour not only offer the worst assistance and advices but also insist to drink before starting the job and insist not to use the protection guard for the disk because is not very visible the working point. On examination he was unconscious and responding to deep painful stimuli with a Glasgow coma scale (GCS) [20] score of 10. Hemodynamically was stabilized and adequate saturation was maintained. On examination there was an 11-4cm lacerated wound on the face caused by angle grinder improper used involving the superior lip, superior alveolar ridge with both superior right incisive

avulsion ,the check suborbital area and the inferior eyelid and the optic globe .There was not active bleeding from the wound at the moment of examination [21]. During the secondary survey, the patient was found to have rib fractures involving three to six ribs on left side which were radiological confirmed but without pneumo or haemothorax [22]. The fractures were caused by falling and projecting of the patient on the stairs. CT scan revealed penetration in the maxillary sinus and orbit with complete destruction of the eye, fractures of the anterior nasal spine piriform aperture, right maxilla and right supraorbital ridge. No endocranial lesions. We ask for help a colleague from ophthalmology explore the orbit and the right eyes and he admit that was complete destroyed and exenterating of the orbit is required [23] (Figure 5).



Figure 5: The the right globe was penetrated and completely destroyed.

The wound was grossly contaminated with sand, mud and fragments from the disk. There was no active bleed from the wound site. After an initial assessment, the patient was moved into the OR to explore and repair the wound under general anaesthesia. 'The bony fractures were reduced and fixed with osteosintesis (superior alveolar ridge and maxilla only). The right globe was enucleated and the final prosthesis fitted a few months. The wounds were debrided with saline and wound edges heavily laden with particulate matter were excised. Oral mucosal and muscle layer closure was performed using Vicryl (polyglactin 910) resorbable sutures. Skin closure was performed using non-resorbable monofilament interrupted sutures [24] (Figure 6). Lacerated wound involving the superior lip, the check sub-orbital area and the inferior eyelid and the optic globe. The patient was admit in the ICU, started, broad spectrum antibiotics, analgesics and tetanus vaccination, Peri-operative intravenous Cefuroxime and Metronidazole were administered for seven days post-operatively. Every day we clean the wound, remove the drain on the 5th day. Also our colleagues from ophthalmology daily check the wound after performing exenterating of the orbit .The recovery was good in 12 days the patient was discharge. The follow-up was performed at one, three and six weeks then at three, six and nine or twelve months,because eye prosthesis was necessary and dental implant.



Figure 6: Lacerated wound involving the superior lip, the check sub-orbital area and the inferior eyelid and the optic globe.

Discussion

Angle grinders are used around the world in large numbers to cut stone, metal and concrete. They are also used to grind pre-welded joints and remove unwanted fragments of metal or ceramics. The disc themselves rotate between 6000 and 15000 revolutions per minute, depending on the machine type and the disc diameter used. A large number of injuries at work or at home are reported in our hospital every year and this is also available for other cities in our country. The main injuries are craniofacial, most frequent midface and mandible, rare superior part with frontal sinus penetrated -2 cases or even with endocranial penetration 1 case. Then with the same frequency are, the injuries of to the upper limbs and, less commonly, the lower trunk. One of the most severe case was a young man with an penetrating neck trauma caused by an angle grinder the disk enter in the neck paramedian through the larynx, pharynx and stopped in the cervical spine (Figure 7). The morphology of the wounds sustained using angle grinders tend to follow the shape of the cutting disc; most often curvilinear but may vary slightly depending on the angle of skin entry. Tissue loss is a common feature. The volume of tissue loss is directly dependent on the

size of the disc used. Finding fragments of disc and the material being cut in the wound is pathognomonic for angle grinder injuries. Therefore debridement of contaminated wounds and excision of ragged edges is vital to optimal healing. Injuries occur for a number of reasons. First the wheel itself may kick back from the surface it is cutting. This will send the rotating disc toward the operator, parallel to the axis at which it is being used. Hence the face is most often at risk of a penetrating wound when looking down along the axis of the cuts being mad. This feature is present in all of the cases reported as all exhibit oblique/parasagittal lacerations parallel to the cutting axis. This risk is increased markedly if the guard has been removed. The use of the wrong size/type of disc or of an old chipped dick. This will increase the likelihood of excessive vibration and of the disc shattering. This usually results in foreign body type injuries (Figure 8). In particular perineal or scrotal injuries occur if the operator straddles the object being cut and can be missed. Overhead use of angle grinders has been associated with fatal intracranial injury and should be avoided. A number of articles have been published to warn of these specific dangers.

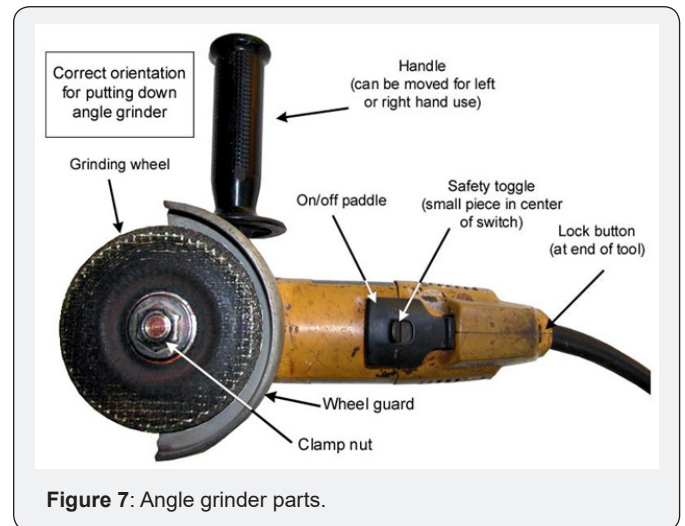


Figure 7: Angle grinder parts.



Figure 8: How is correct to use an angle grinder, protective methods.

In order to reduce the risks of injuries there are general guidelines about the use of power tools such as checking how they are maintained and insisting on the use of protective clothing.

Aesthetically pleasing wound closure can be achieved with thorough debridement, resection of wound edges and careful layered functional closure after reduction and fixation of facial bone injuries. However the injuries produced can often be disfiguring, permanently disabling or even fatal and are mostly preventable. We suggest that before using such a power tool that both manufacturer's guidance and national guidelines should be consulted dependent on the size of the disc used (Figure 9). Our closed survey revealed that the workers were not informed well on the selection and correct fitting of the disc; and the importance of protective guard for the machine and personal protective equipment's for individual operating these machines. The shop owners surveyed said that the wrong type of disc was frequently used, increasing the likelihood of the disc shattering. Finally, shattering of the disc can occur when the disc has been incorrectly fitted. The discs rotate between 10,000-

15,000rev/min, giving sufficient momentum to travel far and penetrate deeply as occurred in these cases (Figure 10). As a preventive measure the users have to be taught and trained to use the correct disc size and type, wear appropriate personal protective equipment's, use the angle grinder with protective guard and maintain the safety by standing perpendicular to the plane of the cutting wheel, and thereby can greatly reduce the occurrence of such injuries. Also, the supervisors in the field have to monitor the safety measures constantly. In addition the healthcare workers have to be oriented well to handle such cases carefully. (Table 2). The cases presented illustrate that the high speed disc of angle grinders does not respect anatomical boundaries or structures. Aesthetically pleasing wound closure can be achieved with thorough debridement, resection of wound edges and careful layered functional closure after reduction and fixation of facial bone injuries. However the injuries produced can often be disfiguring, permanently disabling or even fatal and are mostly preventable. We suggest that before using such a powerful tool that both manufacturer's guidance and national guidelines should be consulted.



Figure 9: Finding the recommended disc.

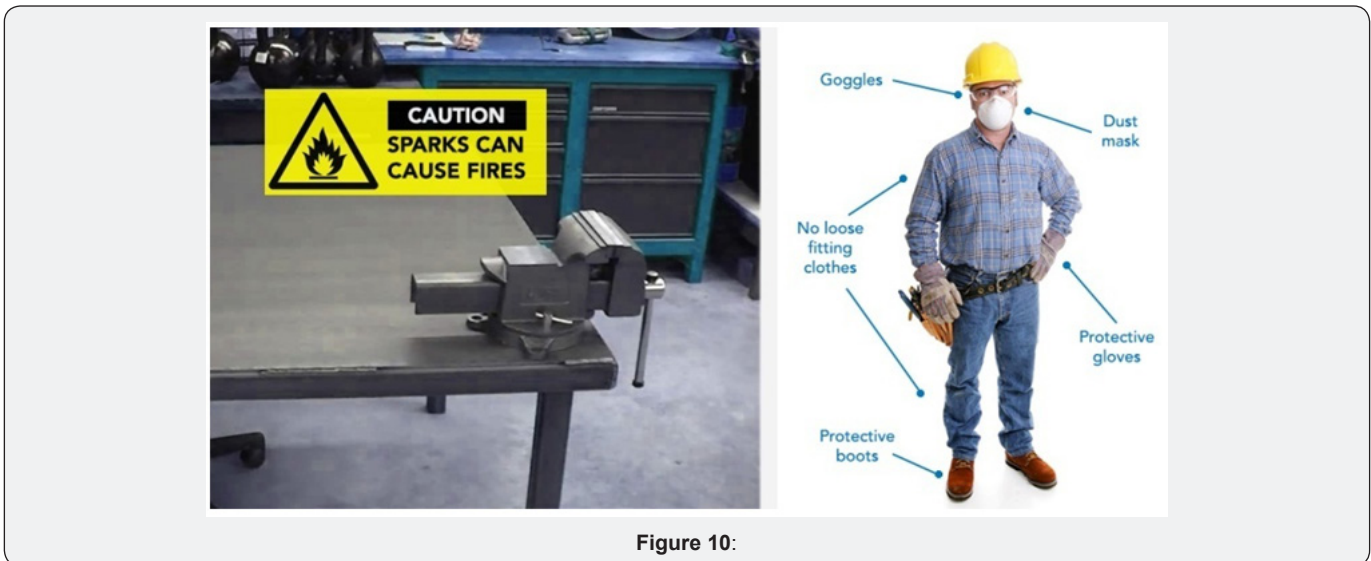


Figure 10:

Table 2

Safe use of Angle Grinders	
Safety Measures	Advantages
Use the correct disc and replace it when is chipped	Reduces the risk of a foreign body injury as a result of disc disintegration
Stop using if vibration is excessive	
Do not remove the guard unless for maintenance	Increases personal protection from direct and foreign body injury
Never use an angle grinder overhead	
Cut in a para-coronal plane to reduce the risk of kick back towards the sagittal plane of the body	
Always wear appropriate protective equipment (gloves, goggles, and hard-hat ,face shield)	

References

- Agrawal A, Malla G, Joshi S, Kumar A (2008) Unusual mode of firearm injury from the recoiled rear end of gun barrel. Singapore Med J 49(9): 238-241.
- (2001) Antiepileptic prophylaxis for penetrating brain injury. J Trauma 51(2): S41-S43.
- Aarabi B (1999) History of the management of craniocerebral wounds. In: Aarabi B (Eds.), Surgeons pp. 281-292.
- Abdoli A, Amirjamshidi A (2009) Work-related penetrating head trauma caused by industrial grinder tool. Arch Iran Med 12(5): 496-498.
- Back DL, Espag M, Hilton A, Peckham T (2000) Angle grinder injuries. Injury 31: 475-476. 10.1016/S0020-1383(00)00025-5.
- Carter LM, Wales CJ, Telfer MR (2008) Penetrating facial injury from angle grinder use: management and prevention. Head Face Med 4: 1.
- Feldman Z, Narayan RK, Robertson CS (1992) Secondary insults associated with severe closed head injury. Contemp Neurosurg 14: 1-8.

- Jandial R, Reichwage B, Levy M, Duenas V, Sturdivan L (2008) Ballistics for the neurosurgeon. Neurosurgery 62(2): 472-480.
- Kaufman HH, Dagi TF, George ED, Levy ML (Eds.). Missile Wounds of the Head and Neck. 1(III): American Association of Neurological.
- Kaufman HH, Schwab K, Salazar AM (1991) A national survey of neurosurgical care for penetrating head injury. Surg Neurol 36(5): 370-377.
- Knapp LW (1966) Occupational and rural accidents. Arch Environ Health.
- HSMO Department of Trade and Industry. 24th (Final) report of the Home and Leisure Accident Surveillance System. 2000, 2001 and 2002 data. 2003. DTI/Pub 7060/3k/12/03/NP URN 03/32.
- Lopez F, Martinez-Lage JF, Herrera A, Sanchez-Solis M, Torres P, et al. (2000) Penetrating craniocerebral injury from an underwater fishing harpoon. Childs Nerv Syst 16(2): 117-119.
- Peek-Asa C, McArthur D, Hovda D, Kraus J (2001) Early predictors of mortality in penetrating compared with closed brain injury. Brain Inj 15: 801-810.
- (2005) Personal protective equipment at work regulations 1992. Guidance on regulations L25. 2005. HSE Books ISBN 07176 61393.
- Regev E, Constantini S, Pomeranz S, Sela M, Shalit M (1990) Penetrating craniocerebral injury caused by a metal rod: An unusual case report. Injury 21(6): 414-415.
- (2000) Safety in the use of abrasive wheels HSG17 (3rd edn.), HSE Books ISBN 0 7176 1739 4.
- Satyarthee GD, Borkar SA, Tripathi AK, Sharma BS (2009) Transorbital penetrating cerebral injury with a ceramic stone: Report of an interesting case. Neurol India 57(3): 331-333.
- Telmon N, Allery JP, Scolan V, Rouge D (2001) Fatal cranial injuries caused by an electric angle grinder. Journal of Forensic Sciences 46(2): 389-391.
- Thurner W, Pollak S (1989) Morphologic aspects of angle grinder injury. Beitrage zur Gerichtlichen Medizin 47: 641-647.
- Tan MH, Choudhari KA (2003) Penetrating head injury from an electrical plug. Injury 34(12): 950-953.
- Wongprasartsuk S, Love RL, Cleland HJ (2000) Angle grinder: a cause of serious head and neck trauma. Medical Journal of Australia 172(6): 275-277.



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