Chaff Machine Injury Of The Elbow– A Case Report

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Abstract
Agricultural machine injuries are very common worldwide and are a cause of major economic burden and permanent physical disabilities. Such injuries carry a grave prognosis as they usually result in traumatic amputation or compound fractures with deep lacerations which are often contaminated. Infection rate in such injuries are too high and undefined fracture patterns usually pose a problem in adequate management and usually require multiple surgeries. A sequential planned tailor made approach is required for management of such injuries. We present a case of chaff cutter machine injury in a 17 years male patient with compound, comminuted, multiple fractures in right elbow with bone loss managed with thorough debridement and minimal internal fixation and single stage surgery with good results. In this case report we used titanium elastic nails as an alternative to joint spanning external fixation for diaphyseal humerus fracture with its advantages. This manuscript also gives an insight regarding prevention of agricultural machine injuries.

Keywords: Chaff cutter, Compound, Comminuted

Introduction
Due to expanding population and shrinkage of agricultural land worldwide there is increasing demand for agricultural products. To cope up with demand and supply ratio and advent of newer technologies there has been increased use of various agricultural machines which also had given rise to increasing incidence of agricultural injuries and accidents. These accidents in agricultural enterprises result in physical disabilities as well as economic loss [1,2]. The most frequent injuries due to agricultural machines are traumatic amputation and open wound of wrist and hand. The right hand is more commonly involved [3]. Chaff cutter machine injuries are very common in India. This machine is used in Indian rural households to chop fodder for feeding draft and mulch to animals. It has been observed that major injuries are caused during children playing with the machine and workers feeding the fodder in to the chute [4].

We report a case of 17 years male with traumatic chaff cutter injury with deep laceration, contamination, and compound intraarticular fracture with bone loss managed with single stage surgery with good outcome. Patient presented to the emergency department with history of injury right elbow due to his right elbow being caught in chaff cutter machine. On examination there was a wound over posterolateral aspect of right arm size 20 centimetres by 10 centimetres (Fig. 1). Wound was contaminated with dirt, grease and hay particles. Lower end of the humerus and elbow joint was exposed, lateral ligament were completely torn off and forearm was connected to the arm with antero-medial soft tissues. There was complete opening of the joint on varus stress. Luckily limb was well perfused, brachial artery was palpable and there was no distal neurovascular deficit. Radiographs revealed comminuted fracture of the olecranon with comminuted lateral condyle humerus fracture with lower third humerus fracture with bone loss from the lateral column of the humerus (Fig. 2).

Patient was taken to the emergency room where thorough debridement and wound lavage was done. Articular reconstruction of lateral condyle fragment was done with two 4 mm cannulated screws. An olecranon fragment was reconstructed with tension band wiring. To stabilise humerus shaft fracture two titanium elastic nails were inserted from the lateral column defect into the proximal humeral fragment. We noticed there was bone loss in the proximal fracture fragment upto one centimetre involving half the circumference of the shaft which prevented complete opposition of the shaft fracture but fracture ends were in contact with each other. Lateral collateral ligament and lateral soft tissue were repaired. After repair elbow was found to be stable and skin was closed under drain. A high arm above elbow slab was given. Postoperatively patient was advised active finger movements. Dressing was changed after 48 hours which was dry and drain removal was done at the same time. Wound

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healed uneventfully and stitches were removed after two
weeks. Postoperative X-rays revealed good reconstruction
of the humeral articular surface and sigmoid notch (Fig. 3).
Elbow was immobilised in plaster for 4 weeks. Repeat x rays at
4 weeks suggested evidence of some bridging callus at fracture
of humerus site with some acceptable varus alignment of
humerus shaft (Fig. 4). At four weeks a posterior removable
splint was given to the patient and intermittent elbow range of
motion exercises were begun. At eight weeks all splints were
discarded. At 6 months postoperatively radiographs (Fig. 5)
showed fracture was consolidated and patient had acceptable
Rom at elbow joint (Fig. 6). Elbow flexion was 10 degrees to
110 degrees with full supination and pronation and DASH
score was 18.3 at 6 months.

Discussion
There is a great variety of farm accidents, and this spectrum of
injuries consists of simple lacerations to traumatic
amputations. Farming accidents do not only depend on
human factors but also environmental and machinery factors
[5]. In a study by Hansen [6], 45% of the injuries involved the
upper extremity, and 45% of these injuries were traumatic
amputations and lacerations. Farm yard amputations carry
poor prognosis and are often not appropriate for micro-
surgery or re-implantation [7]. The infection rates in injuries
with farming devices are high [8]. These injuries are more
common in male population and young Boys as they are more
frequently engaged in farm activities and have risky behavior
[9].

Agricultural injuries with bone loss are a great challenge to
orthopaedic surgeon. Gross contamination, soft tissue injuries
along with the non specific fracture pattern make these
injuries unique. Bone loss and articular involvement may
further complicate the picture. There is no specific literature
available to manage such injuries. Open fractures are
associated with an increased risk of infection and healing
complications [2]. A specific planned approach may result in a
good outcome. Thorough clinical examination backed with
necessary investigation may help the surgeon in planning
management and prognostication of such injuries. Thorough
debridement and lavage should be first priority followed by
fixation. Early joint mobilisation also should be the goal but
management should be tailor made according to the nature of
injury. Our first priority in this case was to prevent infection
and next to preserve as much joint movement as possible and
to give patient a functional painless and stable elbow joint.
This was achieved with thorough debridement and lavage
followed by articular reconstruction. Management of fracture
shaft of humerus was our next goal. Due to extensive
contamination we refrained from plating of the shaft fracture.
We took the opportunity to use small lateral column bone
defect though which we were able to negotiate two 2.5 mm
titanium elastic nails into the shaft without making any new
entry portal ,which were intended to use as a temporary
internal fixation implant. We explained the patient future
requirement of second surgery for nail removal and plating
shaft humerus fracture. Evidence of callus at humeral fracture
site prompted us to continue with TENS and ultimately it
obviated the need for second surgery.
Conclusion
Agricultural injuries present with a wide spectrum. Most often they result in primary amputation or with neurovascular involvement of the extremity. Most commonly these injuries require multiple surgeries and multi disciplinary approach involving orthopaedic surgeon, plastic surgeon and microvascular specialist. Proper clinical examination along with proper documentation and prognostication of such injuries is very critical to manage such injuries. Sequential planned approach may lead to favorable outcome in these injuries. Thorough debridement with minimal implant decrease the risk of infection in such injuries. Titanium elastic nails are good alternative against external fixator in such cases. They are less cumbersome than external fixator, chances of pin tract infection are prevented, early joint motion can be started as joint is not spanned and it has been proved in studies that solid titanium implant are more resistant to formation of bacterial biofilm than stainless steel implants and thus decrease chances of infection. These injuries may be prevented by shielding the rotator component of machinery, proper information and educating farming families and school children of farmers and, preventing entrance of children in area of machines.

References