Truncal Degloving Injuries: A Marker of Distinct Morbidity and Mortality

Fernando Antonio Campelo Spencer Netto¹, Mariana Juliato Becker², André Pereira Westphalen³, Allan Cezar Faria Araujo⁴

ABSTRACT

Introduction: Traumatic degloving injuries consist of detachment of skin and subcutaneous tissue from the underlying fascia and muscles due to high-energy shearing forces. Open degloving injuries of the torso are poorly described, have many different presentations, and their full extension is difficult to assess. This article aims to describe this patient population (soft tissue injuries, associated trauma, treatment particularities, morbidity, and mortality), alerting emergency surgeons to this entity.

Materials and methods: This study is a case series of blunt trauma patients presenting open degloving injuries of the torso. After institutional research and ethics board approval, data were collected through electronic medical records at the Hospital Universitário do Oeste do Paraná, Cascavel-Paraná, Brazil. The degloving injuries were classified according to the involved torso segment. The treatment of the degloved area was divided as contamination control, infection and ischemia control, and reconstruction techniques. The data were organized and displayed in tables and text.

Results: Six patients were identified, with age of 36.5 ± 7.5 years, and injury severity score (ISS) of 31.3 ± 16.7 . All presented hypovolemic shock on admission and shearing forces as trauma mechanism. In four patients, degloved area involved pelvis/perineum, one patient injured the anterior wall of the abdomen, and one the back of thoracolumbar area. All patients had associated injuries. The number of surgeries for treatment of soft tissue injuries was 5.1 ± 2.6 . Hospital stay was an average of 40.2 days. Two patients died.

Conclusion: Patients with open degloving injury of the torso have high ISS. Morbidity and mortality may occur due to the associated lesions or soft tissue lesions. Surgery requirements, the high number of procedures, and long hospital length of stay reinforce the complexity of the treatment and the need for adequate therapeutic planning.

Keywords: Degloving injuries, Multiple trauma, Wounds and injuries.

RESUMO

Introdução e Objetivo: Desenlramento traumático é o descolamento entre a pele e o tecido subcutâneo da fáscia e músculos devido à trauma de alta energia, por força de cisalhamento. A lesão envolvendo o tronco é pouco descrita, com espectro de apresentação amplo, sendo difícil a avaliação de sua extensão. O objetivo deste artigo é descrever esta população, as lesões de partes moles, traumatismos associados, peculiaridades do tratamento, morbidade e mortalidade, alertando os cirurgiões de emergência para a entidade.

Materiais e métodos: Esta é uma série de casos de vítimas de trauma contuso com desenlramento aberto do tronco. Os pacientes foram selecionados pelo cirurgião co-responsável pelo tratamento através de revisão dos casos que necessitaram de reoperação programada. Os dados foram coletados em prontuário eletrônico no Hospital Universitário do Oeste do Paraná, Cascavel – Paraná, Brasil. As lesões de partes moles foram classificadas de acordo com o segmento do tronco que foi acometido. O tratamento da área desenlramada foi segmentado em cirurgias de controle de contaminação, infecção e isquemia (desbridamentos), e técnicas de reconstrução. Os dados foram organizados e expostos em tabelas e texto, e calculados conforme adequado.

Resultados: Seis pacientes foram identificados, com idade média de $36,5 + 7,5$ anos, e ISS de $31,3 + 16,7$. Todos apresentavam choque hipovolêmico na admissão e cisalhamento como mecanismo de trauma. A maior parte dos pacientes teve acometimento principal pélvico/perineal, um de parede anterior do abdômen, e um com lesão cutânea somente em dorso. Foram identificadas lesões associadas em todos os pacientes. A média de cirurgias para tratamento das lesões de partes moles foi de $5,1 + 2,6$. A permanência hospitalar foi em média de 40,2 dias. Dois pacientes foram à óbito.

Conclusão: O paciente com desenlramento traumático aberto de tronco tem elevado ISS. Morbidade e mortalidade podem ocorrer pela presença de lesões associadas ou pelas lesões de partes moles. O tratamento é cirúrgico, o número de procedimentos e longo tempo de internamento dos sobreviventes reforça a complexidade do tratamento, e a necessidade de planejamento terapêutico adequado.

Palavras-chave: Desenlramentos cutâneos, Ferimentos e lesões, Traumatismo múltiplo.

Panamerican Journal of Trauma, Critical Care & Emergency Surgery (2020): 10.5005/jp-journals-10030-1271

INTRODUCTION

Degloving injuries occur when there is a detachment of the skin and the subcutaneous tissue from the underlying fascia and muscles due to high-energy shearing force trauma, compromising the blood supply of the overlying tissues. It can occur anywhere in the body, most commonly limbs, scalp, face, and genitalia. Concomitant lesions and local bleeding may reduce the functionality and/or viability of the affected tissues.¹⁻⁷

¹Department of Medicina, Universidade Estadual do Oeste do Paraná, Cascavel, Paraná, Brazil

²Department of General Surgery, Hospital Universitário do Oeste do Paraná, Cascavel, Paraná, Brazil

^{3,4}Department of General Surgery, Universidade Estadual do Oeste do Paraná – Unioeste, Cascavel, Paraná, Brazil

Corresponding Author: Mariana Juliato Becker, Department of General Surgery, Hospital Universitário do Oeste do Paraná, Cascavel,

There is a paucity of literature regarding extensive degloving truncal injuries. These injuries always require surgical treatment, at least for cleaning or debridement purposes. The spectrum of the entity is broad, and the assessment of its extent is difficult, either in the initial assessment because of the presence of multiple concomitant traumas that may require immediate life support measures, or because of the possibility of progression of the injured segment due to ischemia and infection, or even necrotizing fasciitis. Immediate recognition of open degloving injuries is important to allow urgent treatment, in order to optimize patient outcomes and decrease rates of complications and mortality.^{1,2-4}

In this article, we review the 4-year experience of a tertiary-care hospital in Paraná, Brazil, in the treatment of patients presenting with extensive truncal degloving injuries. The aim of the article is to characterize the patients using demographic data, the soft tissue injuries, associated trauma, treatment of the soft-tissue injuries, morbidity, and mortality, thus providing information of this entity to the emergency surgeons undertaking their care.

MATERIALS AND METHODS

This is a retrospective and descriptive case series. This study was approved by the Research and Ethics Committee from Universidade Estadual do Oeste do Paraná - Unioeste (Plataforma Brasil CAAE 66923317.6.0000.0107).

Patient identification was performed by the surgeon co-responsible for the continuity of treatment of the emergency and trauma department of the institution (FACSN), reviewing all trauma cases that required surgery by the general surgery team. Primary surgeries were performed by all general surgeons on the service. All of them, after the acute phase of treatment, were managed and reoperated by the same surgeon (FACSN). The inclusion criteria were as follows: age greater than 18 years and victims of blunt trauma, who also had truncal degloving injury. Degloving injuries were defined as wounds with detachment of the skin and subcutaneous tissue from the underlying fascia during the initial physical examination or during surgery.

Data were collected through electronic medical records at the Hospital Universitário do Oeste do Paraná, Cascavel-Paraná, Brazil, from trauma patients admitted through the emergency room between January 1, 2014, and February 28, 2017. The following information was obtained: demographics, trauma mechanism, admission vital signs, transfusion requirement, associated injuries, timing and number surgical procedures (soft tissue and other), protective ostomy requirement, hospital length of stay, complications, and mortality. Computed tomography reports, radiographs, surgical descriptions, and discharge summaries were reviewed.

Regarding the involved body area, open degloving injuries were classified as (a) anterior abdomen, (b) anterior thorax, (c) back, and (d) pelvis/perineum. Patients with lesions extending up to the thigh or dorsum, which also involved pelvis, were included in the pelvis/perineum subgroup, since this group has specific concerns with fecal contamination. The presence and severity of hypovolemic shock were estimated according to the advanced trauma life support (ATLS)⁸ criteria. Injury severity score (ISS)⁹ was calculated from the summary of injuries.

Regarding the treatment, the surgical procedures for soft tissue were evaluated according to the purpose: (a) contamination, infection, and ischemia control (debridement) and (b) reconstruction

Paraná, Brazil, Phone: +55 (44) 99911 8929, e-mail: marianajbecker@gmail.com

How to cite this article: Spencer Netto FAC, Becker MJ, Westphalen AP, et al. Truncal Degloving Injuries: A Marker of Distinct Morbidity and Mortality. *Panam J Trauma Crit Care Emerg Surg* 2020;9(1):49–55.

Source of support: Nil

Conflict of interest: None

techniques. The data were organized and displayed in tables and text, expressed in absolute numbers, percentages, or mean and standard deviations, as appropriate. Due to the nature of the study and number of patients, no further statistical analysis was appropriate.

RESULTS

Six patients with truncal degloving injuries formed the study group. The mean age of the patients was 36.5 ± 7.5 years, 4 (67%) of the patients were males. The mean ISS was 32.7 ± 16 . All patients presented with hypovolemic shock on admission, and 5 (83%) required blood transfusion within the first 48 hours of presentation.

The mechanism of injury was shearing forces in all patients, and the details are presented in Table 1.

All six patients presented with open injuries on admission. The sizes varied widely from small wounds with few centimeters of extension (Cases 3 and 4) to extensive wounds (2400 cm²) with severe contamination including debris and feces (Cases 1 and 6). Most of the patients had pelvic/perineal involvement with deep and extensive degloving injuries. There was no patient with an anterior chest open degloving injury. Details of the lesions are described in Table 1.

Intra-abdominal injuries were present in four patients: two patients with hollow viscus injuries and two with solid organ injuries. One patient had an evisceration. Extra-abdominal injuries were present in all patients: pelvic fractures (four patients), spine fractures (four patients), traumatic brain injury (three patients), extremity fractures (two patients), and lower extremity arterial injury (one patient).

The overall number of surgeries required per patient was 5.8 ± 2.9 . For the treatment of the soft tissue injuries, a mean number of 5.1 ± 2.6 (6 ± 2.6 procedures for survivors) surgeries were required. For the survivors, the soft tissue injuries were reconstructed by primary closure with closed suction drainage (Case 3) and progressive tension sutures associated with negative pressure therapy (Cases 1, 2, and 6; Figs 1 and 2). For those where progressive tension sutures and negative pressure were used, the skin closure was fully achieved in one patient while in two other patients, the areas not covered by skin were allowed to heal by secondary intention. Parts of the wound management were conducted as outpatients.

Hospital length of stay ranged from 8 to 131 days, with an average of 40.2 days (mean of 56.2 days for survivors) and 5 (83%) patients required ICU admission.

Two patients died (Cases 4 and 5), who in a retrospective analysis had a delay in the recognition of the extent of the soft-tissue injuries (Case 4). The patient presented with a dorsal degloving injury near an exposed fracture-dislocation of the spine (Fig. 3). Computed tomography showed small locules of free retroperitoneal, which appeared to originate from the soft tissue lesion, along with pneumorachis. The evolution of the case demonstrated a duodenal laceration diagnosed on the fourth day of hospitalization by

Table 1: General characteristics

Case	Age/gender	Trauma mechanism	ISS	Shock on admission	Associated trauma	Initial characteristics of the degloving injury	Number of surgeries	Surgery descriptions	Specific aspects of the injuries and learning points	Complications during hospitalization	Outcome
1	33 F	Motorcycle collision followed by deceleration sitting on asphalt	22	Class I	Mild TBI* Sacrum fracture Pelvic fracture Laceration of the right thigh	Laceration extending from the back to the lateral aspect of the thigh, wide and deep; it was possible to palpate the spine. Sacrum was exposed. Severe debris contamination.	9	1st DH: Wound cleaning and borders approximation 4th DH: Debridement of the thigh from its lateral portion to the thoracolumbar transition, and vacuum therapy 6th DH: Colostomy, debridement of the thigh, 10th, 11th, 13th, 17th, 21th, 40th DH: Debridement of the thigh from its lateral portion to the thoracolumbar transition, and tension sutures, and negative pressure therapy.	Large wound (2400 cm ²) in a morbidly obese patient. The association of tension sutures and negative pressure was utilized (Fig. 1).	Fasciitis of the dorso and thigh Renal failure Hypotonic sphincter	Survival
2	31 M	Trauma with agricultural machinery, being suspended by the abdomen in the combine's arm	22	Class II	Acetabular fracture. Quadriceps and patellar tendon ruptures. Bowel evisceration	Evisceration secondary to traumatic abdominal hernia	5	1st DH: Primary closure of the colon injury, abdominal wall defect/hernia debridement and soft tissue negative pressure therapy. 7th, 9th, 15th, 19th DH: Debridement, tension sutures, and negative pressure therapy.	Initial wound's extension of 900 cm ² . The association of tension sutures and negative pressure therapy was utilized, reaching 99% closure (Fig. 2)	None	Survival
3	48 M	Run over by a truck and dragged over 1 meter	18	Class II	L5 transverse process fractures. Acetabular fracture. Pelvic fracture	Deep perianal laceration and detachment of the subcutaneous tissue of the back	3	1st DH: Colostomy, debridement and compressive dressing of the perineum 3rd, 9th DH: Debridement, local drainage	Large closed degloving injury with partial detachment of the rectum and injury of the anal sphincter	Hypotonic sphincter	Survival

Contd...

Contd. ...

Case	Age/gender	Trauma mechanism	ISS	Shock on admission	Associated trauma	Initial characteristics of the degloving injury	Number of surgeries	Surgery descriptions	Specific aspects of the injuries and learning points	Complications during hospitalization	Outcome
4	32 F	Pedestrian hit and thrown by car	59	Class III	Renal trauma Right renal artery thrombosis Duodenal injury Severe TBI Bilateral tibial fracture Open fracture and llisthesis of L1, L2, Inferior limbs arterial injuries	Dorso laceration (15cm flap), with exposure of the spine. Severe debris contamination	2	1st: Irrigation and approximation of dorsal laceration (at admission) 4th DH: Bilateral amputation of the legs 5th DH: Repair of the duodenal injury, piloric exclusion, gastrostomy, retroperitoneum drainage, and jejunostomy	The duodenal injury was not diagnosed at first. CT showed retroperitoneum air, and it was thought due to the degloving injury (Fig. 3). The delay on this diagnose worsened the prognosis	Bilateral leg amputation Rhabdomyolysis	Deceased
5	30 M	Fall from a moving truck, and subsequently hit over the abdomen by a tree trunk	45	Class IV	Grade IV splenic injury Severe TBI L1–L5, and T11 transverse process fractures	Perianal laceration. Detachment of the subcutaneous tissue posterior to the rectum, exposed sacrum (Fig. 4). Anal sphincter lesion	5	1st DH – Splenectomy and colostomy 1st, 2nd DH: Perianal/pelvic debridement and local drainage 4th DH: Recolostomy and pelvic/gluteus debridement 6th DH: Dorso and gluteus debridement and negative pressure therapy	On the initial physical exam the rectum detachment was considered an anal injury, resulting in perianal contamination for hours inside the hospital, and septic shock during second intervention	Necrotizing fasciitis Rhabdomyolysis Septic shock	Deceased
6	44 M	Fall from a motorcycle followed by deceleration on asphalt	22	Class III	Sacral fracture with sacroiliac disjunction Open fracture – dislocation of the ankle C7 and T1, L2–L5 spinal process fractures Multiple fractures of L1, and L1–L2 llisthesis	Perianal laceration and exposure of the soft tissue on external face of thigh	7	1st DH: External fixation of the calcaneus and pelvis, colostomy. 11th, 17th, 20th, 26th, 33th, 40th, 43th DH: Debridement of the thigh/gluteus/dorso, including its muscles and negative pressure therapy. 49th DH: Cholecystectomy, jejunostomy for feeds and decompression. 52th DH: Lumbar arthrodesis	Extensive injury of the soft tissue, involving muscles, leaving exposed fractures of the spine and sacrum without any covering (Fig. 3). Muscular necrosis and infection were harder to treat when compared with skin and subcutaneous	Paraplegia Rhabdomyolysis Pneumonia Necrotizing fasciitis Osteomyelitis Acute cholecystitis and pancreatitis	Survival

*DH, day of hospitalization, TBI, traumatic brain injury

Figs 1A to C: Case 1: (A) Large wound, with extension from the back to the thigh after debridement; (B) Representation of progressive tension sutures and negative pressure therapy; (C) Final aspect, with wound's closure of 95%

Figs 2A to C: Case 2: (A) Wound's aspect after first debridement; (B) Detailing internal skin and subcutaneous detachment from aponeurosis; (C) Final aspect of the wound

Figs 3A and B: Case 4: Computed tomography of the abdomen, with pneumorrhachis, fracture, and listhesis of L1 and L2

leaking of enteric secretion via the wound in the back. In addition, the patient had multiple associated injuries that also required surgical treatment. Case 5 was admitted with hypovolemic shock and had abdominal free fluid, undergoing emergency laparotomy (splenectomy and colostomy; Fig. 4). In the postoperative period, the persistence of shock led to a reevaluation of the case. The presence of perineal soft tissue injuries, partial anal disinsertion from the perineum (initially attributed to a rectal injury), and an anal sphincter laceration resulted in severe fecal contamination of the

surrounding tissues for a prolonged period (18 hours from trauma to the treatment of the soft tissue injuries; Fig. 4).

DISCUSSION

This paper reports a case series of victims of extensive truncal degloving injuries, treated at a regional tertiary hospital with 200 beds in Brazil. The hospital admits about 450 traumatized patients and performs about 55 trauma laparotomies annually. To our knowledge, this is the largest case series reported specifically

Figs 4A to C: Case 5: (A) After first surgery, without specific degloving treatment; (B) Computed tomography after initial surgery. Arrows indicate air on subcutaneous tissue and muscles; (C) Aspect of the 4th DH, wound with necrotizing fasciitis of the dorso and perineum

directed at truncal degloving injuries. The authors, based in the small number of cases, were not able to recognize specific regional trauma pattern. They hypothesize that the paucity of reports in the literature are mainly due to the lack of their recognition, which is further detailed below. Although this type of lesion is associated with significant morbidity and mortality, the pathology is poorly described in the literature. In addition to characterizing this population, the authors would like to collaborate with other higher volume trauma centers and continue to study this entity.

Truncal degloving injuries are uncommon compared to extremity soft tissue injuries. Considering all degloving injuries, only 2.8% are located over the abdomen and 4.3% over the perineum.¹ The energy required to damage the abdominal wall is frequently sufficient to cause visceral and osseous injuries.^{2,4,6} Considering the mechanisms of trauma causing the open traumatic degloving injury, there is a significant risk for serious associated injuries, which was observed in our cohort with high ISS and hypovolemic shock in all patients. The average ISS of patients with any degloving injury was 13.8,¹ significantly lower than the ISS of 32.7 in those with truncal degloving injuries. A possible explanation for the low number of patients with these injuries is presumably the high prehospital mortality. Furthermore, serious associated injuries causing hypovolemic shock and early death may distract the attention of the medical team away from the degloving injuries.¹ The improvement in prehospital trauma care is resulting in more patients with severe injuries surviving to hospital. The number of patients with extensive truncal degloving injuries, with high morbidity and mortality, is expected to increase.

Truncal degloving injuries may be underestimated due to abbreviation of the resuscitation, focusing on life-sustaining measures. The physical examination of the external degloved area in the emergency room is a poor indicator of its extent and depth, either because the injured area may evolve with infection and/or ischemia or because the wound is irregular making it difficult to properly measure the degloved area.^{1,3} The authors believe that the full extent of the injury and detached area should be measured at least during surgery. Often the extent of the destruction is larger than the skin breach or skin loss. Due to the irregularity of the wound, we suggest applying sterile plastic on the raw surface and to cut it according to dimensions. Later, the area covered by the sterile

material can be measured using computer software algorithms. This technique will be further detailed in a separate study.

Of the existing classifications of degloving wounds, there is one based on its pattern and created for extremity injuries and is as follows: (a) limited to abrasion/avulsion, (b) non-circumferential, (c) circumferential in a single plane, and (d) circumferential in multiple planes.³ The application of this classification in the degloved truncal wounds is limited, since the wounds are rarely circumferential in a living patient. Necrosis and infection may increase the wound's size. Therefore, a specific classification for the trunk is necessary, considering the involvement of deeper layers, the extent of the detached layers, and skin loss. The information collected for the present analysis is insufficient to generate a new classification.

In the present study, all patients had significant associated injuries, both intra- and extra-abdominal. The high occurrence of associated lesions has been previously described. It is estimated that associated fractures are present in 40–85% of the patients, in and around the affected areas. Most patients have traumatic brain injury, spinal trauma, abdominal, pelvic-perineal, and thoracic trauma.^{3,10,11} Another case series has shown that 100% of the patients with abdominal degloving injuries (all underwent surgery for the treatment of soft tissue) had an associated pelvic fracture.⁴

Truncal degloving injuries constitute a surgical condition that requires immediate recognition, is time consuming, and delayed treatment may result in further increase in wound extension due to ischemia and/or infection, including necrotizing fasciitis and consequent debridement.^{1,3,4} Treatment of the injured patient will follow the priorities previously established by the ATLS. Regarding soft tissues, despite the lack of unique therapeutic guidelines, the initial treatment of open lesions involves surgical wash out and/or debridement. During surgery, particularly if the patient is hemodynamic stable, the surgeon must inspect the entire wound carefully, estimate its extent, remove all contamination, and consider how to protect blood supply and avoid infection. It is important to evaluate the wound characteristics such as skin color and temperature, and presence or absence of bleeding, to assess tissue viability.² However, until complete control of contamination/infection has been obtained, there may be an increase in the wounded area due to tissue necrosis and consequent need of repeated surgical debridements.^{1–3,11}

The principles for the treatment of contamination/infection involve preserving areas potentially viable in order to facilitate subsequent reconstruction. Early and recurrent surgical debridement reduces the chance of colonization and infection, and the use of broad-spectrum antibiotics is recommended.^{3,4} The use of negative pressure therapy is a strategy to reduce the number of dressing changes, manage potentially high-volume exudate, and optimize granulation tissue in preparation for the reconstruction phase.^{1,3,4}

After controlling contamination/infection in the degloved area, the surgeon should plan and begin the next phase of care, aiming to reduce the wounded area. The final defect size may vary from superficial to deep, according to the loss of skin, subcutaneous tissue, fascia, and musculature, and the reconstruction of this area can be challenging. Reconstructive surgery for the trunk has different levels of complexity and may require multiple surgeries, depending on the extent and location. The techniques available include primary closure (if possible, as the first option), healing by secondary intention, use of negative pressure associated or not with progressive wound closure techniques, and use of tissue expanders, grafts, or flaps. Since the clinical challenges are associated with extensive soft-tissue defects, the use of a single technique can be disadvantageous: (a) secondary-intention healing could lead to a higher risk of infection and prolong the hospitalization; (b) cutaneous grafts or flaps may become unfeasible for large wounds, due to the required extension of donor area. Therefore, the association of different techniques is commonly used.

In this study, patients required 2–9 different procedures to treat the soft tissue injuries. After initial stabilization of the patient, control of the contamination, and debridement of non-viable tissues, the wound edges began to be approximated, obtaining primary closure in one patient surviving hospitalization, with minimal perianal skin loss. Of the techniques for large soft tissue injuries with significant substance loss, the use of progressive vacuum-assisted closure deserves mention. The progressive tension closure was used in association with negative pressure therapy, closing or gradually approaching the edges of the wound. This type of reconstruction was used in the three surviving patients with large soft-tissue defects (Cases 1, 2, and 6). In a morbidly obese patient (Case 1; Fig. 1) and with an extensive wound (2400 cm²), the technique of progressive tension closure and negative pressure therapy allowed the closure of 95% of the wound in 21 days, after stabilization and control of necrosis/infection. The remaining area was allowed to heal by secondary intention. The same technique was used in Case 2, with a 99% closure of an initial lesion of 900 cm² in 12 days (Fig. 2). In the third patient in whom the technique was used, there was a significant area of muscular necrosis, in addition to the skin and subcutaneous tissue, and several exposed spinal process fractures (Case 6). The technique was effective in preventing local infection and maintaining a clean wound closure of about 50% of the wound. This patient, however, took longer to heal in comparison to other patients with intact aponeurosis and muscles.

Four patients developed necrotizing fasciitis. In addition to having open wounds and gross contamination (either environmental or visceral), the soft tissue can also be compromised by the trauma.

Missed diagnosed injuries occur in multiple trauma patients. Of the two patients who died, delay in diagnosis may have contributed

significantly to their demise. Thus, multiple injuries should alert the surgeon of difficulties in interpreting the physical examination and imaging in the presence of open degloving truncal injuries. Other studies have shown an overall mortality of 9% of the patients with any degloving injury, with half of them dying within 24 hours of admission arguably due to severity of other injuries.¹

The treatment and hospital stay of such patients are prolonged, and they often develop infectious complications over the soft-tissue injured areas, as well as from the other associated injuries.¹⁰ Other studies report a mean length of hospital stay of 32 days.^{6,10,12} In the present study, the patients were managed mostly by general surgeons. Plastic surgeons followed the patients after stabilization of the lesions but did not perform surgeries.

CONCLUSION

Truncal degloving injuries result from shearing forces and these patients present high ISS. Morbidity and mortality are caused by both the soft tissue wounds and other associated injuries. The requirement for surgical treatment, the number of surgical procedures, and long hospitalization of the survivors reinforce the complexity of the treatment and the need for adequate therapeutic. In the presence of compatible trauma mechanism and open wound on trunk, the acute care surgeon should be suspicious of these injuries, in order to provide early diagnosis and adequate therapeutic planning.

REFERENCES

1. Hakim S, Ahmed K, El-Menyar A, et al. Patterns and management of degloving injuries: A single national level 1 trauma center experience. *World J Emerg Surg* 2016;11:35.
2. Gilbert BC, Bui-Mansfield LT, Dejong S. MRI of a morel-Lavallée lesion. *AJR Am J Roentgenol* 2004;182(5):1347–1348.
3. Latifi R, El-Hennawy H, El-Menyar A, et al. The therapeutic challenges of degloving soft-tissue injuries. *J Emerg Trauma Shock* 2014;7(3):228–232.
4. Veena PW, Babu R, Venkatesh MS, et al. Degloving injuries of the abdominal wall. *J Wound Care* 2013;22(10):562–568.
5. Ojuka KD, Nangole F, Ngugi M. Management of anterior abdominal wall defect using a pedicled tensor fascia lata flap: A case report. *Case Rep Med* 2012. 487126.
6. El Kafsi J, Kraus R, Guy R. A report of three cases and review of the literature on rectal disruption following abdominal seatbelt trauma. *An R Coll Surg Engl* 2016;98(2):86–90.
7. Cornelissen MP, van Buijtenen J, van den Heuvel B, et al. Blunt abdominal wall disruption by seatbelt injury: a case report and review of the literature. *Bull Emerg Trauma* 2016;4(2):105–109.
8. ATLS: Advanced Trauma Life Support for Doctors (Student Course Manual) – 8th edition. American College of Surgeons – 2008.
9. Baker SP, O'Neill B, Haddon W Jr, et al. The injury severity score: A method for describing patients with multiple injuries and evaluating emergency care. *J Trauma* 1974;14(3):187–196.
10. Milcheski DA, Ferreira MC, Nakamoto HA, et al. Subatmospheric pressure therapy in the treatment of traumatic soft tissue injuries. *Rev Col Bras Cir* 2013;40(5):392–396.
11. Mello DF, Assef JC, Soldá SC, et al. Degloving injuries of trunk and limbs: Comparison of outcomes of early versus delayed assessment by the plastic surgery team. *Rev Col Bras Cir Rio de Janeiro* 2015;42(3):143–148.
12. Hinck D, Franke A, Gatzka F. Use of vacuum-assisted closure negative pressure wound therapy in combat-related injuries – literature review. *Military Medicine* 2010;175(3):173.