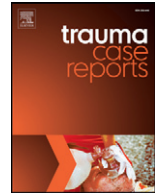




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### Case Report

## Perineal impalement injury by steel bar – A near miss

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### ABSTRACT

Adult perianal impalement injuries are uncommon but can carry high morbidity and mortality. We report a case of a penetrating perineal trauma in a construction worker highlighting an innovative use of a Sengstaken tube to control his pelvic bleeding, as well as the operative management of his sphincteric injury. This article illustrates principles of effective acute care and discusses a diagnostic approach to evaluating a potentially complex injury, as well as the decision-making process with regard to fecal diversion and choice of sphincteric repair.

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### Introduction

Adult perineal impalement injuries are uncommon and notorious for their complex injury patterns and risk of massive pelvic bleeding. We herein describe an innovative use of balloon tamponade to achieve haemostasis of pelvic bleeding in a patient with perianal impalement injury and the challenges in his subsequent management.

### Case report

A 35 year-old construction worker fell off a ladder and was impaled by reinforcement bars through the perineum. He self-extricated the metal rods with resultant evisceration of small bowel through the perianal defect (Fig. 1).

He initially presented to an outpatient facility in hypotensive shock and was immediately resuscitated according to Advance Trauma Life Support protocols. Laparotomy with exploration of the retroperitoneum

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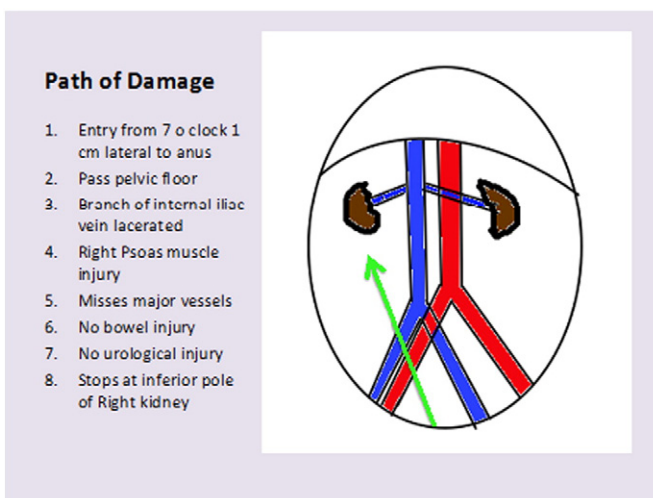


**Fig. 1.** Herniation of bowel through perineal defect.

was performed revealing injuries extending from the perineum to the inferior pole of the right kidney as delineated in the schema above (Fig. 2). Of note, a 4 cm perineal defect at the 7 o'clock position with a breach of the pelvic floor muscles and laceration of a branch of the right internal iliac vein were noted. The vein was repaired and the abdomen packed. Damage control resuscitation was ongoing.

Post-surgery, the abdominal drains continued to drain blood and the patient was brought back to the operating theatre (OT) for re-exploration; persistent ooze was noted from the pelvic floor. As the latter was too wide for the Foley's catheter to provide sufficient tamponade for haemostasis, a Sengstaken Blackmore (SB) tube was inserted through the perineal defect. The gastric balloon was inflated with 170 ml of saline and tension was applied to the SB tube as shown in Figs. 3–5, to tamponade the pelvic bleeding.

The abdomen was closed temporarily and patient was brought to the surgical intensive care unit. A total of 13 units of PCT, 9 units of FFP, 12 units of platelets, 1 L cryoprecipitate were administered and the patient was transferred to a tertiary trauma centre for further management.



**Fig. 2.** Trajectory of steel bar penetrating into retroperitoneum.



**Fig. 3.** Pelvic tamponade with an inflated gastric balloon of a SB tube.

Upon arrival, a CT scan was performed showing active contrast extravasation in the presacral space. Angioembolization of a branch of the left inferior rectal artery was performed (Fig. 6). A change of his temporary abdominal closure dressing was performed and the patient was further resuscitated with a view to return to the OT in 24–48 h after physiological optimization.

The following day, a further reduction in the patient's haemoglobin prompted another angiogram and this demonstrated a pseudoaneurysm of the median sacral arterial branch, which was successfully coiled.

When optimised, the patient was examined and found to have deficient anal tone. He was brought back to the OT where a rigid sigmoidoscopy was performed and showed no breach of the rectal mucosa. The SB tube and packs were removed and a washout of the abdomen was performed. The pelvic floor muscles and sphincter muscles were apposed and a diverting loop colostomy was fashioned. The perineal cavity was further debrided and a Vacuum Assisted Closure (VAC) device was placed over the perineum for closure. The patient's anal tone remained deficient despite repair of the pelvic floor muscles thus a left gluteus maximus rotational flap was fashioned to reconstitute the anal sphincters and close the perianal defect (Fig. 7).

Post-repair anomanometry demonstrated satisfactory mean resting and squeeze anal pressures (99 mm Hg and 117 mm Hg) respectively. However, a short functional anal canal and small rectal volume were noted. He underwent reversal of stoma six weeks later with uneventful postoperative recovery, apart from mild fecal incontinence which eventually resolved. At two months follow up, he was cheerful, able to ambulate well and compliant with biofeedback exercises; his stools were well-formed and he had bowel movements twice daily.

## Discussion

Perineal impalement injuries are uncommon but can potentially carry high morbidity and mortality [1]. Etiologies include falling on the offending objects, physical assaults and sexual abuse [1,3,7–8]. Fatality of



**Fig. 4.** Tension applied to the SB tube with a saline bottle.

the injury depends on the presence of vital organ injury, degree of blood loss and adequacy of resuscitation, as well as control of sepsis [1]. Given the rarity and diverse patterns of injuries, there are currently no standardised treatment guidelines. Nonetheless, a few learning points can be highlighted from this case.

For impalement injuries, the offending object should be left in-situ [1,2,7] until the patient is appropriately resuscitated and transferred to the operating theatre. In this case, the patient extricated the rod himself, resulting in evisceration of bowel loops through the perianal defect. This could have aggravated the bleeding by causing further shearing compounded by the loss of tamponade [2] effect. Injuries may also be missed without the impaled object being left in-situ, especially when multiple body cavities are traversed.

Next, the patient unfortunately presented with severe hypotensive shock and this denied the patient the opportunity of a preoperative computed topography (CT) imaging [3] that would have yielded useful information such as presence of vital organ or retroperitoneal injuries, arterial bleeding or rectal perforation which would warrant different treatment approaches. However, even without the benefits of having the offending object in-situ and preoperative imaging, potential injuries can still be assessed by determining the route of the penetration under anaesthesia [3,8,18]. In this case, the eviscerated small bowel was reduced through the perineal defect away from the rectum. Rectal injury was excluded with digital rectal examination, rigid sigmoidoscopy [3,8,9,21] and intraoperative rectal insufflation. This patient, however, sustained anal sphincter damage, which is common in perianal extra-peritoneal injuries [11,19]. Urethral injury should also be excluded with cystoscopy [8,18–20], or retrograde urethrogram in this setting if blood in the urethral meatus or high-riding prostate is observed.

Sengstaken Blakemore tube was used to effect balloon tamponade to control pelvic venous bleeding. To date, balloon tamponade has been described to control uterine bleeding [10] and in rectal surgeries [23] but not in trauma. This is the first reported use of the SB tube to tamponade pelvic bleeding. Examples of balloons used include the Bakri 'SOS' (Silicone Obstetric balloon) with a capacity of 500cm<sup>3</sup> of saline; the

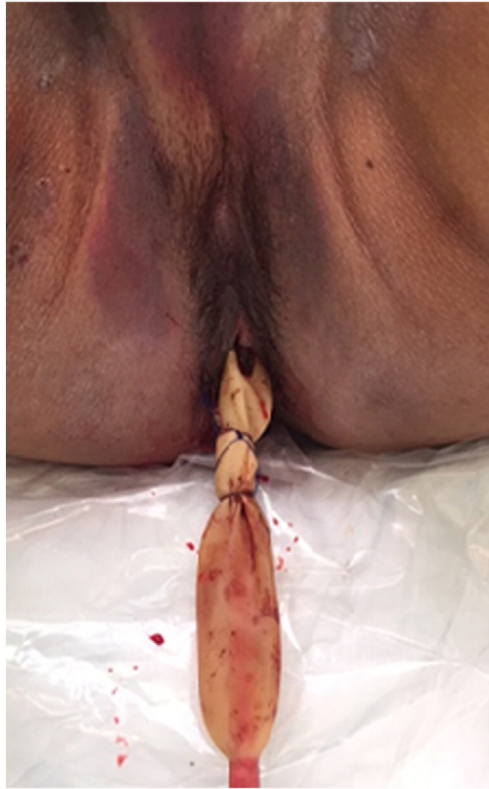


Fig. 5. SB tube exiting through the perianal defect.

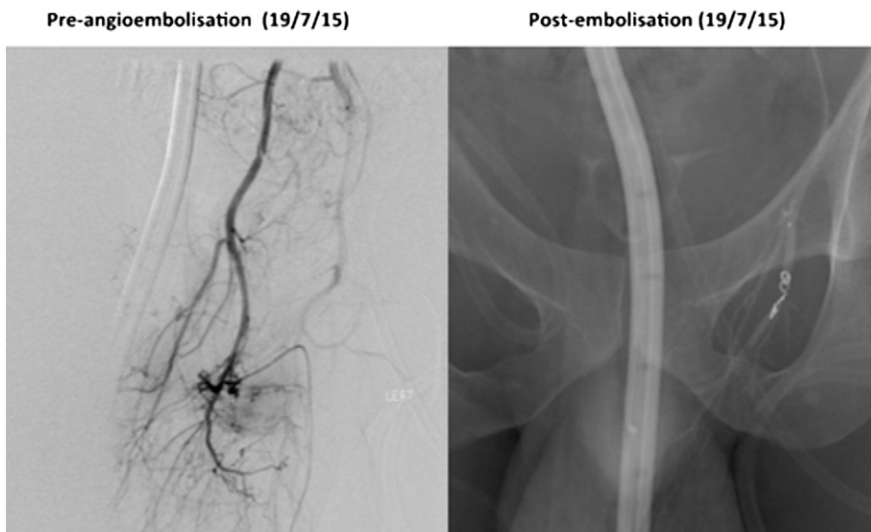


Fig. 6. Angioembolisation of pelvic vessels.



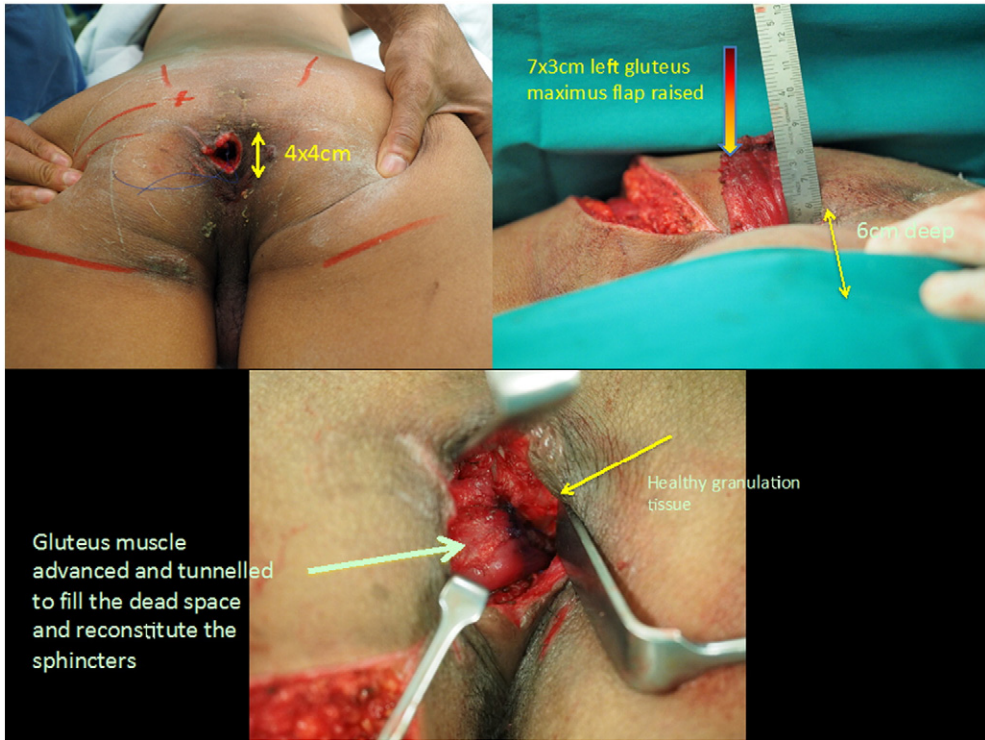


Fig. 7. Intra-operative pictures of perineal defect prior to closure with advancement flap.

Foley catheter (110cm<sup>3</sup>) and the Rusch urological balloon (up to 1500cm<sup>3</sup>) [10]. In this case, the SB tube was chosen because its gastric balloon could accommodate a larger volume compared to the Foley's catheter and also for its ready availability. Currently there is no guideline on the ideal volume of saline needed to achieve effective tamponade for pelvic bleeding in the presacral space but our empirical use of 170 ml of saline in the gastric balloon attached to a weight seemed adequate to control the pelvic ooze. An alternative to balloon tamponade that can be considered in a similar setting would be breast expanders but it was not readily available then and the SB tube was a less costly substitute [23].

Fecal diversion was performed for this patient despite absence of rectal injury in order to facilitate nursing care of the perianal wound post-sphincter repair. This is especially so in anticipation of incontinence secondary to short functional anal canal and small rectal volume. Prior studies recognise the role of colostomy in reducing local wound complications post-perineal trauma [3,9,12]. The potential benefits of fecal diversion for wound care need to be weighed against the morbidity of stoma creation and the decision should be individualised [9,16].

Our patient sustained anal sphincter injury as a result of a perianal impalement injury and the resultant fecal incontinence can potentially be socially embarrassing. Despite repairing the pelvic floor muscles, his anal tone was still deemed weak and we decided to improve sphincteric function by using the gluteal muscle. The gluteal muscle was chosen over the gracilis because the gluteus maximus provides greater muscle bulk [6,17,24] and thus more consistent contractile sphincter mechanism even after muscle atrophy post-transposition compared to the tendinous sling of graciloplasty [17]. In addition, the muscle bulk was useful in filling up the considerable perianal defect. Unlike the gracilis muscle, there is less traction on the neurovascular pedicle of the gluteus maximus after transposition [6,17]. Furthermore, gluteoplasty results in an enhanced natural anorectal angle compared to gracilioplasty resulting in better continence [17]. The abovementioned advantages of using the gluteal muscle perhaps explain the normal resting and squeeze anal pressures in this patient. Currently he is still experiencing mild incontinence to liquid stool, which is

alleviated by anti-motility and stool bulking agents. The initial phase of mild fecal incontinence was expected in view of the patient's short functional anal canal and small rectal volume. His incontinence has improved with time after biofeedback exercises.

## Conclusion

Perineal impalement injuries are uncommon but can carry high morbidity and mortality. Early effective resuscitation and accurate assessment of the associated injuries are crucial in improving patients' survival. High index of suspicion is required to identify occult injuries with subsequent anatomical restoration and functional rehabilitation being important goals of patients' holistic management.

## Conflict of interest

All the authors report no conflict of interest.

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