# Robotic Trauma Surgery (RTS): The Use of Robotic Surgery in Abdominopelvic Trauma

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## Background

Traditionally, operative treatment of abdominopelvic trauma has been limited to an exploratory laparotomy followed by an open repair of the injury. Diagnostic and therapeutic laparoscopy emerged as an alternative to this, however the approach has not been widely adopted. With the expansion of robotic surgery, a new minimally invasive operative platform is available for patients with traumatic injuries, however data on its utility in the setting of abdominopelvic trauma remains sparse. We propose that due to the enhanced visibility and dexterity offered by robotics, we can safely perform minimally invasive robotic explorations in patients with blunt and penetrating abdominal trauma and provide safe and reliable injury identification and treatment.

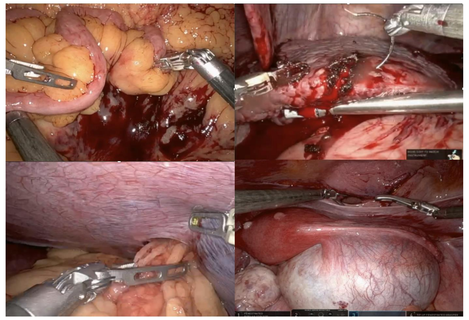

*Figure 1: Traumatic Injuries treated robotically. Pictured right to left are mesenteric hematoma from blunt trauma, knife stab wound to the liver, knife stab wound to the diaphragm, blunt intraperitoneal bladder injury*

## Methods

We performed a retrospective chart review of all trauma patients over the age of 18 that underwent robotic abdominal explorations for blunt and penetrating trauma at our academic level one medical center from 2022-2025. The data was collected through a REDCAP database. Primary outcomes were to show safety, feasibility and diagnostic accuracy of robotic surgery in the management of abdominopelvic trauma and to provide guidelines for operative intervention.

## Results

Between 2022 and 2025, a total of 42 patients (23 blunt and 19 penetrating); (Figure 1) underwent robotic abdominal exploration for traumatic injury, during which 49 discrete injuries were identified and treated. All procedures were performed by 7 robotically trained, surgical critical care and general surgery boarded trauma surgeons.

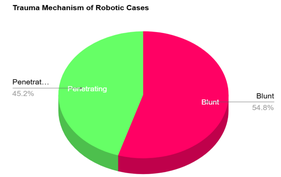


*Figure 2: Penetrating vs. Blunt trauma distribution*

Operative interventions included 15 diagnostic explorations with evacuation of hemoperitoneum, 5 repairs of traumatic abdominal wall hernias, 12 diaphragm repairs, 5 small bowel resections or primary repairs, 6 colon resections or repairs, 1 bladder repair, 1 hepatorrhaphy, 2 liver laceration repairs requiring hemorrhage control, and 2 splenic laceration repairs requiring hemorrhage control (Figure 2).

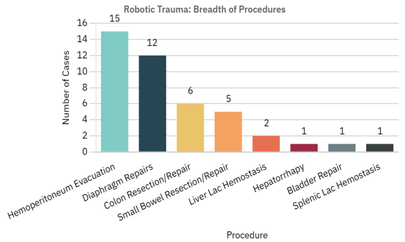


*Figure 3: Injuries managed robotically*

## Results

Twenty patients were transported directly from the trauma bay to the operating room, with a mean time to operative intervention of 2 hours and 21 minutes (range, 27 minutes to 8 hours 38 minutes). The mean operative duration was 2 hours and 14 minutes (range, 40 minutes to 5 hours 1 minute). There were 0 missed injuries. Injury Severity Scores ranged from 5 to 66, and Glasgow Coma Scale scores ranged from 3T to 15. Five of 42 patients were intubated in the trauma bay. The mean preoperative transfusion requirement was 2 units of blood products (range, 0–5 units), with 32 patients requiring no transfusion. The mean presenting blood pressure was 124/74 mmHg, although initial systolic blood pressures were as low as 60 mmHg by palpation. All patients were normotensive upon arrival to the operating room. Preoperative CT of the abdomen and pelvis was obtained in all cases.

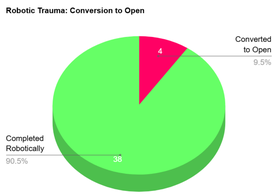


*Figure 4: Proportion of cases completed robotically vs conversion to open*

The mean postoperative length of stay was 5.6 days. Conversion to open laparotomy occurred in 9.5% of cases. Postoperative complications included one takeback for bleeding, one hernia recurrence and one seroma at a prior hernia repair site.
Among diagnostic explorations, complications included one iatrogenic small bowel injury during port placement, one iatrogenic small bowel serosal tear, one postoperative ileus, and one mortality following transition to comfort-focused care due to severe pulmonary compromise.

## Discussion and Conclusions

Robotic trauma surgery (RTS) represents a potentially safe and effective alternative to exploratory laparotomy or conventional laparoscopy in appropriately selected patients. Proposed selection criteria include individuals sustaining blunt or penetrating abdominal trauma despite Glasgow Coma Scale score or intubation status who demonstrate hemodynamic stability in the trauma bay, either prior to or following blood product resuscitation, and who have undergone computed tomography of the abdomen and pelvis confirming suspected intra-abdominal injury.Relative contraindications include suspected multifocal small bowel injuries and the presence of intracranial hemorrhage (subarachnoid, subdural, or intraparenchymal) with concomitant concern for bowel injury, as these conditions may limit the safe application of Trendelenburg positioning. Absolute contraindications include refractory hypotension despite activation of a massive transfusion protocol.

## Acknowledgements

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