The Role of Interventional Radiology in Pediatric and Adolescent Trauma: A Review of Current Practices at a Level 1 Trauma Center

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Abstract

Objective: Acute trauma management requires a multi-disciplinary approach. Interventional radiology procedures (IRPs) have a well-established role in adult trauma. However, the role of IRPs in pediatric and adolescent trauma is less well-defined. This study assessed outcomes in trauma patients <18 years who underwent IRP. **Methods:** We performed a retrospective review of trauma patients <18 years at a Level 1 trauma center from 2018 to 2022. Primary outcomes were in-hospital mortality, length of stay (LOS), and procedural complications. Data on transcatheter-arterial embolization (TAE) and drain placement were collected and stratified by mechanism of injury (MOI). Values are reported as mean±SE. Univariate analyses compared the groups. **Results:** Twenty patients (18/20, 90% male) were included. Blunt trauma (N=9) patients were younger than penetrating trauma (N=11) patients (12.3±1.7 vs. 16.0±0.2 years, p=0.03). TAE was more frequent in blunt (89% vs. 18%, p=0.006), while drain placement was more common in penetrating trauma (82% vs. 11%, p=0.006). Penetrating trauma had a higher incidence of fluid collection as an indication (82% vs. 11%, p=0.006). Time to first IRP was shorter in blunt compared to penetrating trauma (65.4±50.2 vs. 192.8±32.2 hours, p=0.04), likely due to acute indications for TAE. Hospital LOS before discharge or transfer to a secondary facility was shorter for blunt than penetrating trauma (6.8±2.1 vs. 16.6±2.1 days, p=0.0043). No complications or in-hospital mortalities were observed. **Conclusion:** IRPs offer adjuncts to surgical care in pediatric and adolescent trauma. This study contributes to the existing knowledge gap. Future multi-center studies are needed to strengthen our findings.

Objectives

The purpose of this study was to describe the gross course of these procedures and assess the outcomes in trauma patients under 18 years of age. From the literature review and nature of this topic the expected sample size was to be relatively small so we focused on major outcome measures. These included primary outcomes like in hospital mortality, length of stay, and any reported procedural complications. The secondary objective was to describe the overall course of these patients.

Results Stratified by MOI

Table 1: Blunt Force Trauma

	Blunt (9)	Penetrating (11)	p-value
Age (years)	12.3±1.7	16.0±0.2	0.03
TAE (%)	89	18	0.006
Drain placement (%)	11	82	0.006
Time to first IRP (hours)	65.4±50.2	192.8±32.2	0.04
*LOS (days)	6.8±2.1	16.6±2.1	0.0043
Total HLOS (days)	21.5±8.8	34.8±16.1	0.5052

Table 1: There were 9 blunt force trauma patients, mostly from MVC. When comparing the comparing the 2 groups, blunt force trauma patients tended to be younger, the predominant procedure used was TAE, the procedures tended to be done much sooner, and the length of stay was shorter.

Table 2: Penetrating Trauma

	Blunt (9)	Penetrating (11)	p-value
Age (years)	12.3±1.7	16.0±0.2	0.03
TAE (%)	89%	18%	0.006
Drain placement (%)	11%	82%	0.006
Time to first IRP (hours)	65.4±50.2	192.8±32.2	0.04
*LOS (days)	6.8±2.1	16.6±2.1	0.0043
Total HLOS (days)	21.5±8.8	34.8±16.1	0.5052

Table 2: There were 11 penetrating trauma patients, they tended to be older and mostly were drain procedures used much later in the hospital course for fluid collections almost 200 hours post presentation and the patients tended to stay longer.

Methods

To do this we performed a retrospective chart review where we pulled all patients under 18 who presented for trauma. The timeline was 2018 to 2022. And we excluded any patients if the IRP wasn't performed by an IR physician. There were 2 procedure groups to collect data on, TAE and drain placements. We stratified them by mechanism of injury, penetrating vs blunt trauma. Unless otherwise noted, values are reported here as mean +/- SE. SEM was chosen as a measure of variance because of the sample size and word limitation.

Overall Results

Overall, 20 patients fit the criteria, this was a more homongenous group with 90% being male. The average age was 14.35, ranging form 2-17 years. There were no reported hospital mortalities or complications. The total average length of stay was 12.22 days.

Procedure Indication

	Blunt n = 9	Penetrating n = 11	p-value
Procedure indication:			
Pelvic fracture, n (%)	4 (44)	1 (9)	
SOI, n (%)	4 (44)	1 (9)	0.007
Fluid collection, n (%)	1 (11)	9 (82)	

Table 3: Shows the difference in procedure indication. Notice blunt group which mainly saw the TAE for bleeding vessesl within the pelvis or towards a particular organ.

Conclusion and Discussion

- IRPs were shown to viable adjunct to surgical care in these cases of pediatric and adolescent trauma.
- Appeared to be a safe option in this specific study population with no complications or mortalities reported.
- TAE was used more in the acute to subacute setting of blunt force trauma to manage bleeding vessels.
- Drain placements were more often used later in the hospital course to manage abdominal fluid collections from penetrating trauma.
- A major limitation is the low number of patients for this study. Another limitation was limitation to a single institution serving a diverse yet single geographical region. Conclusions need to be validated with larger patient sample sizes from multiple institutions. Determination of other markers of safety and efficacy are also required to validate the utility of IRPs in pediatric trauma.

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