

Laparoscopy versus laparotomy for pediatric patients with abdominal firearm injuries

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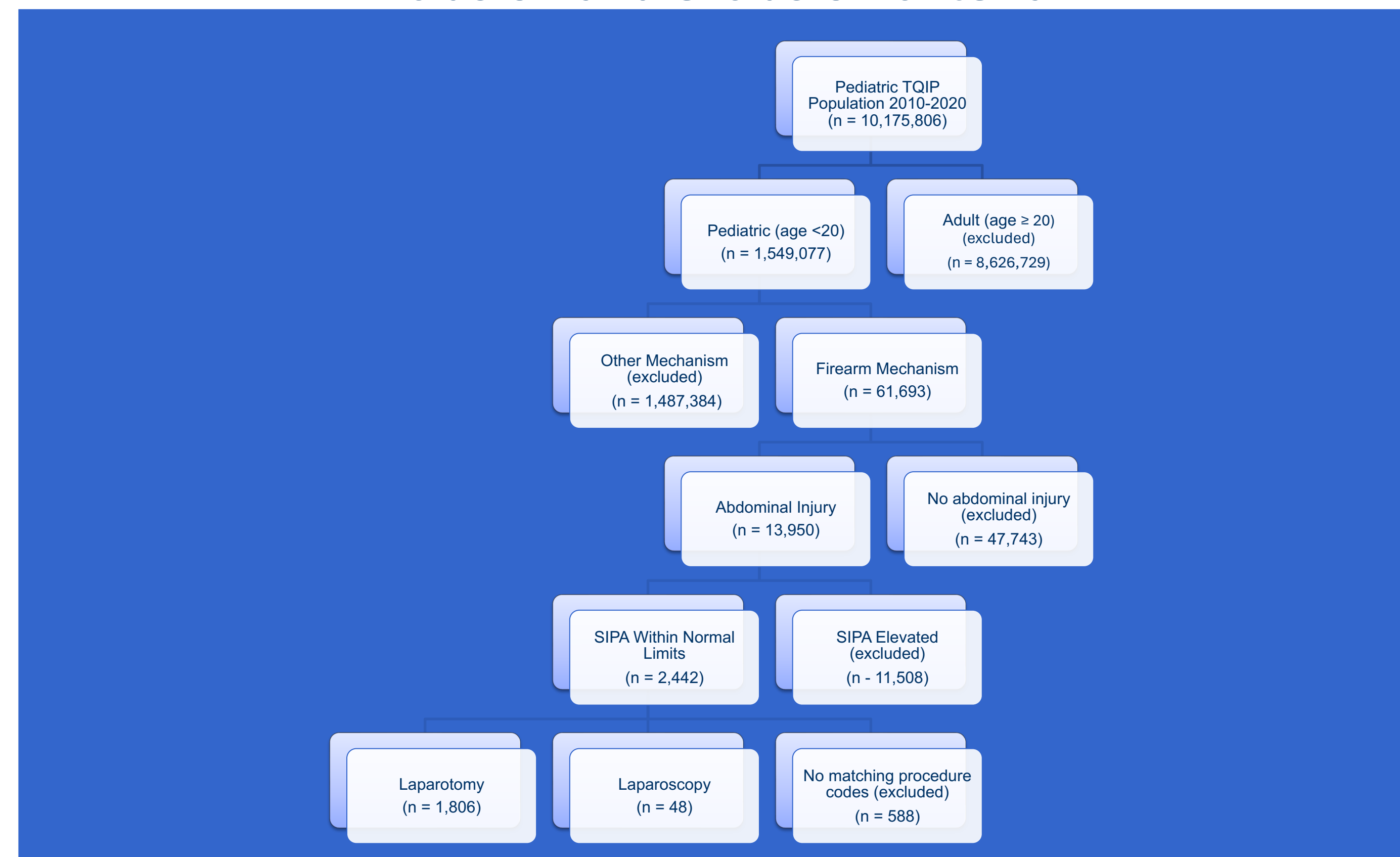
Purpose

Current guidelines recommend that pediatric patients with penetrating abdominal injuries be managed with exploratory laparotomy. However, recent research in adults suggests that the use of laparoscopy may be preferable in selected populations. The purpose of this study was to compare clinical outcomes of hemodynamically stable pediatric patients with abdominal firearm injuries that were managed with laparoscopy versus laparotomy.

Methods

- A retrospective study was conducted using data from the Pediatric Trauma Quality Improvement Program (PedsTQIP) database. Pediatric patients with abdominal firearm injuries from 2010 to 2020 were sorted into a laparotomy group (n = 1806) and a laparoscopy group (n = 48) using ICD-9 and ICD-10 procedure codes. Primary outcomes were rates of complications and infections. Secondary outcomes included transfusions, mortality, any Intensive Care Unit (ICU) stay, hospital length of stay (LOS), and ICU LOS. Data were analyzed in a fashion similar to an intention-to-treat principle.
- Demographics and numerical results were characterized using descriptive statistics. Results were compared using Welch's two-sided t test. Categorical outcomes were measured by proportion and odds ratios and were compared using Fisher's Exact test. Statistical significance was set to $p < 0.05$. Microsoft Copilot AI used for coding assistance. Data was analyzed using R Studio, Version 2023.09.1+494 (Posit Software, PBC).

Inclusion and exclusion criteria



Results

- Laparoscopy was associated with younger mean age (13.4 years versus 15.6 years in the laparotomy population, $p = 0.02$) and higher mean GCS (mean 13.8 versus mean 12.6 in the laparotomy group, $p = 0.03$); no significant difference was found in proportion of sex or in ISS between the populations.
- Rates of complications were significantly lower in the laparoscopy group (21.1% versus 4.2%, odds ratio [OR] 0.16 [0.02, 0.63], $p = 0.002$), but there was no significant difference in rates of infection (6.8% versus 0%, OR 0, [0.00, 1.12], $p = 0.07$).
- The rate was lower in the laparoscopy group for both any ICU stay (62.5% versus 77.4%, OR 0.49, [0.26, 0.94], $p = 0.02$) and transfusions (35.4% versus 57.1%, OR 0.41, [0.21, 0.78], $p = 0.003$). The mortality rate was not statistically significant between groups (10.4% versus 17.5%, OR 0.25, [0.17, 1.40], $p = 0.25$) and the mean LOS and mean ICU LOS were both shorter in the laparoscopy group but were not statistically significant (11.4 versus 14.2 days for LOS, $p = 0.19$ and 4.7 versus 6.8 days for ICU LOS, $p = 0.16$).

Primary and Secondary Outcomes

	Laparoscopy	Laparotomy	Odds Ratio	95% Confidence Interval	P Value
Total Population (N=)	48	1806			
Complications n (%)	2 (4.2)	381 (21.1)	0.16	0.02, 0.63	0.002
Mean	0.1	0.3			0.009
Median	0	0			
SD	0.5	0.6			
IQR	0, 0	0, 0			
Infections n (%)	0 (0)	122 (6.8)	0	0.00, 1.12	0.07
Mean	0	0.1			< 0.001
Median	0	0			
SD	0	0.3			
IQR	0, 0	0, 0			
Mortality n (%)	5 (10.4)	316 (17.5)	0.25	0.17, 1.40	0.25
ICU Stay n (%)	30 (62.5)	1397 (77.4)	0.49	0.26, 0.94	0.02
Transfusions n (%)	17 (35.4)	1031 (57.1)	0.41	0.21, 0.78	0.003
LOS (days)					
Mean	11.4	14.2			0.19
Median	7	9			
SD	13.9	18.4			
IQR	2, 13	1, 18			
ICU LOS (days)					
Mean	4.7	6.8			0.16
Median	3	4			
SD	7.7	10.4			
IQR	0, 5.3	1, 8			

Conclusions

Laparoscopic management of abdominal firearm injuries in hemodynamically stable patients is associated with lower rates of complications, transfusions, and ICU stay than management with laparotomy. The results from this retrospective study suggest that this topic merits further research in the form of a larger prospective trial to further evaluate the difference in outcomes associated with taking an initial laparoscopic approach to manage hemodynamically stable pediatric patients with abdominal firearm injuries.

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