

The Safety and Feasibility of Minimally Invasive Ladd’s Procedures in Adult Patients: A NSQIP Analysis

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Introduction

- Congenital intestinal malrotation results from incomplete rotation and fixation of the midgut during development.
- A subset of cases can present in adulthood with variable symptomatology.
- Treatment is the Open Ladd’s procedure - detorsion of volvulus, division of Ladd’s bands, widening of mesenteric base, appendectomy.
- Minimally invasive (MIS) Ladd’s procedures can have significant advantages; data is sparse in adults.
- **This study aims to clarify the relative safety, efficiency, and utilization of minimally invasive Ladd’s procedures**

Methods

- Retrospective cohort study ACS NSQIP using years 2022–2023.
- Ladd’s procedures identified with CPT code 44055.
- Cases categorized as MIS (laparoscopic or robotic) or open.
- Primary outcome: length of stay (LOS) in days. Secondary outcomes: 30-day morbidity, mortality, post-op LOS.
- Mann–Whitney, Chi Squared, and Fisher’s used for univariate analysis. Multivariable linear regression with unstandardized beta coefficients back-transformed (e^B) to corresponding percentage change. Multivariable logistic regression used for MIS utilization.

Figure 1. Case filtering process for relevant Ladd’s procedures.

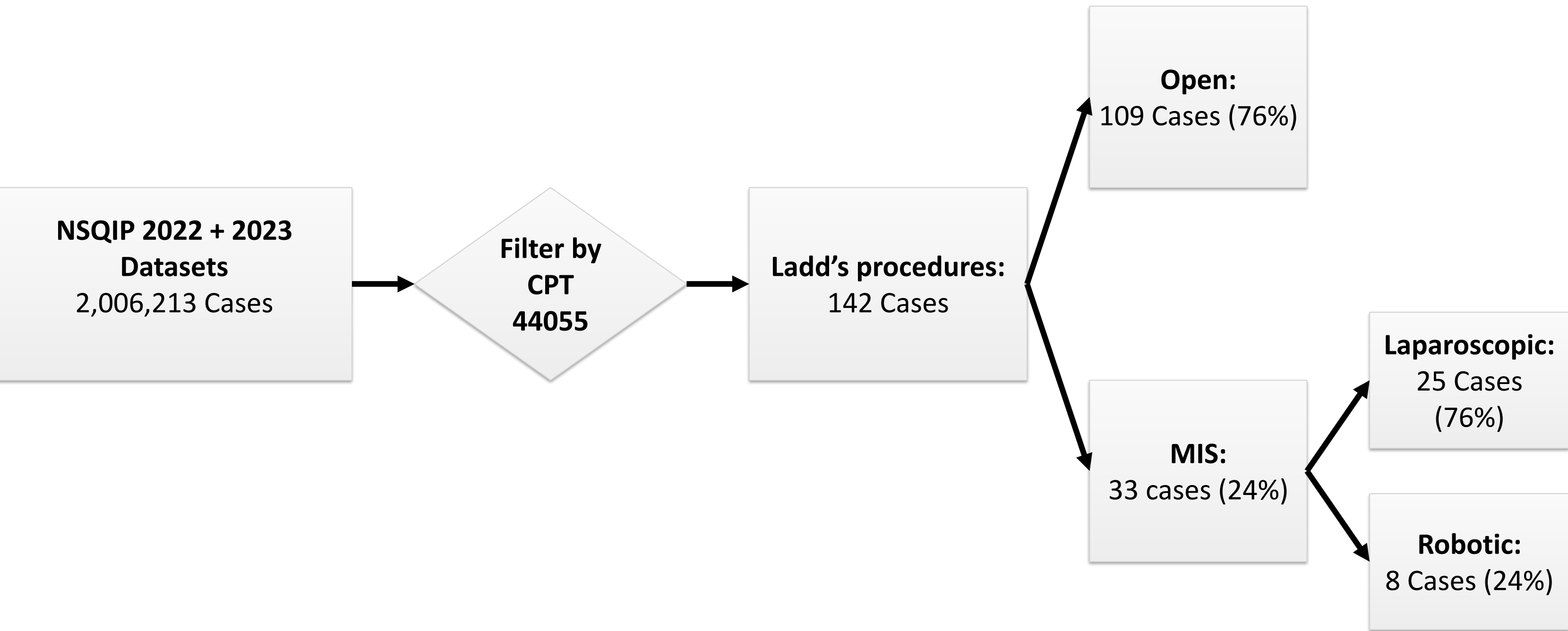


Table 1. Selected Baseline Characteristics

Characteristic	Open (n=109)	MIS (n=33)	p -value
Age (Mean, 95% CI)	58.2 (54.4, 62.0)	47 (40.1, 54.0)	0.005
BMI (Mean, 95% CI)	26.5 (25.0, 28.1)	27.4 (24.9, 30.0)	0.385
Female	58 (53.2)	26 (78.8)	0.014
Hispanic Ethnicity	9 (8.3)	5 (15.2)	0.315
ASA III, IV, or V	34 (31.2)	14 (42.4)	0.294
Hypertension	48 (44)	6 (18.2)	0.008
Transfer from Facility or Hospital	21 (19)	0 (0)	0.004
Elective	27 (24.8)	17 (51.6)	0.005

Table 2. Selected Post-Operative Outcomes

	Open (n=109)	MIS (n=33)	p-value
Total Length of Stay (days, 95% CI)	7.89 (6.81, 8.96)	3.12 (1.83, 4.41)	<0.001
Post-Operative Length of Stay (95% CI)	6.81 (5.83, 7.78)	2.45 (1.41, 3.50)	<0.001
Days from Admit to OR (95% CI)	1.07 (0.74, 1.40)	0.64 (0, 1.27)	0.004
Operation Time (min, 95% CI)	101 (86.65, 116.9)	103 (80.8, 126.2)	0.375

Table 3. Multivariable Analysis of Total Length of Stay

Factor	Effect			
	Unadjusted β (95% CI)	Size	% Change	p
MIS approach	-0.871 (-1.137, -0.604)	0.42	-58.14	<0.001
ASA III, IV, or V	0.347 (0.068, 0.627)	1.42	41.54	0.015
Age	0.001 (-0.006, 0.007)	1.00	0.06	0.854
BMI	0.000 (-0.015, 0.014)	1.00	-0.01	0.984
Female	-0.084 (-0.311, 0.144)	0.92	-8.03	0.468
Non-Elective Case	0.115 (-0.118, 0.348)	1.12	12.17	0.331
Transfer	-0.143 (-0.456, 0.169)	0.87	-13.36	0.365
Hypertension	0.011 (-0.262, 0.285)	1.01	1.15	0.934
Days from Hospital Admission to Operation	0.180 (0.119, 0.240)	1.20	19.68	<0.001

Table 4. Multivariable Analysis of Post-Op Length of Stay

Factor	Unadjusted β (95% CI)		Percent Change		p
			Effect Size		
MIS approach	-0.893 (-1.185, -0.600)		0.41	-59.05	<0.001
ASA III, IV, or V	0.395 (0.088, 0.701)		1.48	48.38	0.012
Age	0.001 (-0.007, 0.008)		1.00	0.07	0.850
BMI	0.001 (-0.015, 0.017)		1.00	0.05	0.947
Female	-0.088 (-0.338, 0.162)		0.92	-8.41	0.487
Non-Elective Case	0.121 (-0.134, 0.377)		1.13	12.89	0.349
Transfer	-0.150 (-0.493, 0.192)		0.86	-13.97	0.386
Hypertension	0.014 (-0.286, 0.313)		1.01	1.36	0.929
Days from Hospital Admission to Operation	0.061 (-0.005, 0.128)		1.06	6.34	0.069

Results

- 142 Ladd’s procedures between 2022 and 2023, 109 (76%) open and 33 (24%) MIS.
- No differences in mortality, reoperation, readmission, operative time, or overall morbidity.
- MIS approach, higher ASA class, and longer Days from Admit to Operation were independent factors affecting total LOS (Table 3).
- MIS approach and higher ASA class were independent predictors of postoperative LOS (Table 4).
- Younger age (OR 0.97, 95% CI: 0.940, 0.999, p = 0.040) and elective case (OR 0.33, 95% CI: 0.128, 0.864, p = 0.024) were independent predictors of MIS utilization.

Conclusion

MIS Ladd’s procedures are associated with shorter LOS without increased morbidity or mortality compared to open surgery. The use of minimally invasive techniques for intestinal malrotation is feasible and should be considered for adult patients, particularly when surgery is performed electively or prophylactically.