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Impact of metal vs non-absorbable, polymer clips during laparoscopic cholecystectomy

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Introduction

- Titanium metal clips have classically been used to occlude the cystic artery and cystic duct during laparoscopic cholecystectomy (LC)
  - Surgeon dependent with options of suturing, stapling, and various energy devices
  - Failure to secure duct leads to bile leak and increased morbidity
- Non-absorbable polymer clips (Hem-o-lok ®) are a more recent alternative with a variety of clip sizes and a locking feature
  - Commonly used, though low-level data

Objective

- *Determine if there is a difference in clinical outcomes or cost between metal clips and polymer clips during LC*

Methods

Approach

- Single-institution, retrospective chart review (2017 – 2019)
- All adult (≥18yo) patients undergoing elective LC

Outcomes

- Primary
  - 30-day presentation to the emergency department (ED)
- Secondary
  - 30-day postoperative complications including: readmission, infection, fluid collections, endoscopic retrograde cholangiopancreatography (ERCP), and death
  - Cost comparison

Statistics

- Multivariable logistic regression controlling for location, race, ethnicity, insurance status, and comorbidities

Results

Table 1. Cohort and operative demographics stratified by clip type. Values represented as n (%) or median [IQR].

Variable	Cohort n = 1244	Metal clip n = 934	Polymer clip n = 310	*p*
Age (years)	50 [38 – 63]	51 [38 – 63]	49 [38 – 62]	0.19
Female	927 (74.5)	698 (74.7)	229 (73.9)	0.76
Race				**<0.01**
White	828 (66.6)	649 (69.5)	179 (57.7)	
Black	274 (22.0)	180 (19.3)	94 (30.3)	
Asian	34 (2.7)	25 (2.7)	9 (2.9)	
Body mass index (kg/m2)	30.4 [26.0 – 36.2]	30.0 [25.7 –35.5]	32.1 [27.1 – 37.9]	**<0.01**
Insurance				
Commercial	788 (63.3)	596 (63.8)	192 (61.9)	0.83
Medicare/Medicaid	397 (31.9)	296 (31.7)	101 (32.6)	
Other	32 (2.6)	22 (2.4)	10 (3.2)	
Self-pay	27 (2.2)	20 (2.1)	7 (2.3)	
Comorbidities				
Hypertension	486 (39.2)	353 (37.8)	133 (43.3)	0.09
Chronic kidney disease	56 (4.5)	42 (4.5)	14 (4.6)	0.96
Cardiac disease	156 (12.6)	119 (12.7)	37 (12.1)	0.75
Depression	191 (15.4)	141 (15.1)	50 (16.3)	0.61
Obstructive sleep apnea	136 (11.0)	93 (10.0)	43 (14.0)	**0.05**
Anticoagulant use	251 (20.2)	183 (19.6)	68 (22.1)	0.33
Length (minutes)	54 [34 – 80]	47 [30 – 77]	67.5 [51 – 84]	**<0.01**
Intraoperative cholangiogram	124 (10.0%)	39 (4.2)	85 (27.4%)	**<0.01**
Location				**<0.01**
Ambulatory surgery center	14 (1.1)	7 (0.8)	7 (2.2)	
Community hospital	950 (76.5)	691 (74.7)	259 (82.2)	
Academic hospital	277 (22.3)	228 (24.6)	49 (15.6)	

Conclusions

- Non-absorbable polymer clips are an **equally safe and a cost-efficient alternative** to traditional metal clips.
  - 75$ savings per case
- 30-day ED visits were increased in the polymer group on univariate analysis.
  - Associated with hospital type and insurance status on adjusted analysis; not clip type.

Table 2. Postoperative outcomes and cost. Values represented as n (%) or median [IQR].

Outcome	Cohort	Metal clip	Polymer clip	*p*
ED presentation	105 (8.5)	67 (7.2)	38 (12.4)	**0.005**
Days to ED presentation	6 [3 – 13]	6 [3 – 14]	6 [3 – 11]	0.705
Readmission	45 (3.6)	30 (3.2)	15 (4.9)	0.173
Days to readmission	7 [3 – 11]	7.5 [4 – 16]	5 [2 – 11]	0.072
Infection	13 (1.0)	7 (0.7)	6 (2.0)	0.072
Fluid collection	10 (0.8)	6 (0.6)	4 (1.3)	0.261
ERCP	11 (0.9)	8 (0.9)	3 (1.0)	0.845
Mortality	1 (0.1)	1 (0.1)	0 (0)	0.566
Cost (dollars)	112.7 (43.8)	131.3 (29.9)	56.4 (28.4)	**<0.001**

Table 3. Logistic regression results for ED visit within 30 days of index operation.

Variable	Odds Ratio (95% CI)	*p*
Polymer clip	1.30 (0.77, 2.19)	0.32
Location (ref academic center)		
Community Hospital 1	0.55 (0.32, 0.94)	**0.03**
Community Hospital 2	0.98 (0.56, 1.72)	0.94
Race/ethnicity (ref non-hispanic, White)		
Hispanic any race	1.02 (0.43, 2.42)	0.97
Non-hispanic, Black	1.41 (0.88, 2.28)	0.16
Non-hispanic, other	0.82 (0.31, 2.14)	0.68
Insurance (ref commercial)		
Medicaid	1.75 (0.83, 3.70)	0.14
Medicare	1.10 (0.67, 1.83)	0.70
Other	2.78 (1.21, 6.41)	**0.02**
Comorbidities (ref 0)		
1	1.17 (0.66, 2.08)	0.60
2 or more	1.41 (0.81, 2.45)	0.22

References

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