ORIGINAL RESEARCH PAPER

General Surgery

COMPARATIVE STUDY OF DIFFERENT TECHNIQUES OF LIGATION & CUT OF CYSTIC ARTERY AND DUCT IN LAPAROSCOPIC CHOLECYSTECTOMY: TITANIUM CLIPS, POLYGLACTIN (VICRYL) INTRACORPOREAL SUTURE,ABSORBABLE CLIPS, AND HARMONIC SCALPEL

KEY WORDS: Laparoscopic Cholecystectomy,Cystic Duct / Artery Ligation,Titanium Clips,Harmonic Scalpel,Absorable Clips,Polyglactin (Vicryl) Intracorporeal Ligation.

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ABSTRACT

Erich Mulle of Gemany performed world first Laproscopic Cholecystectomy (LC) in 1985,while Video Lap Technique of LC poularised in world by Phillippe Mouret of France in 1987,Dr T E Udwadia performed fist LC in India in 1990.Elective removal of Gall bladder is done by 85-90% in World as well as in urban Hospitals of India.Biliary Leakage due to Bile / Cystic Duct Injury occurs in about 0.3 to 1-2% of cases and bleeding due to Cystic Artery and Liver bed occurs in 0.8 to 2% cases.**Background:**Secure ligation of the cystic duct and artery on both side followed by in between cut is the important step in laparoscopic cholecystectomy (LC) to prevent postoperative bleeding and bile leakage.This study compares titanium clips, polyglactin (vicryl) intracorporeal ligation,absorbable clips and harmonic scalpel in terms of safety and complications.**Methods:**Prospective randomized study of 80 patients (20 per group) undergoing elective LC. Primary outcomes: Postoperative Bleeding, Bile Leakage. Secondary: Pain,Nausea / Vomiting,Abdominal Distension,Cholangitis,Pancreatitis,Cholangitis, Hospital Stay.**Results:** Bile leakage was lowest with harmonic (0-1%) and absorbable clips (0.5-2%), higher with titanium (0.8-4%) and Polyglactin (Vicryl) intracorporeal ligation (0.5-3%).Harmonic group had shorter operative time and less pain and bleeding .No significant differences in Postoperative Pain,Nausea / Vomiting,Abdominal Distension,Pancreatitis or Cholangitis or Hospital Stay.All techniques were safe,with harmonic and absorbable clips showing advantages in select outcomes.**Conclusion:**Harmonic scalpel and absorbable clips are effective alternatives to titanium clips, with potential benefits in reduced complications and operative efficiency but costly,may not be affordable in many Hospitals in India.Polyglactin (Vicryl) intracopeal ligation is cost-effective but technically practice demanding.So Titanium Clips are mostly used in India.

INTRODUCTION:

Patients having upper abdominal pain with or without jaundice are easily detected Gall Bladder diseases often associated with cholelithiasis by Ultrasonography,a modality present at most health centres even in rural areas of India.Elective removal of Gall bladder is done by 85-90% in World as well as in urban Hospitals of India so Cholecystectomy is in often in list of Surgeries of most hospitals across India.In most secondary and tertiary care hospitals,mostly Cholecystectomy is perfomed by Gold Standard Laproscopic Method.Erich Mulle of Gemany performed world first Laproscopic Cholecystectomy (LC) in 1985,while Video Lap Technique of LC poularised in world by Phillippe Mouret of France in 1987,Dr T E Udwadia performed fist LC in India in 1990. Biliary Leakage due to Bile / Cystic Duct Injury occurs in about 0.3 to 1-2% of cases and bleeding due to Cystic Artery and Liver bed occurs in 0.8 to 2% cases.Secure ligation of the cystic duct and artery on both side followed by in between cut or Division is the important step in laparoscopic cholecystectomy (LC) to prevent postoperative bleeding and bile leakage

AIMS & OBJECTIVES;

Proper management of the cystic duct and artery in Calot's triangle is essential to avoid major complications like bile duct injury, bile leakage (0.5–2% incidence), and bleeding.Traditional titanium clips are widely used but carry risks of slippage, migration and long-term issues.Alternatives include intracorporeal suture ligation by suture polyglactin (Vicryl), absorbable/polymer clips and energy devices like the harmonic scalpewhich offer sealing without foreign bodies until conversion to open cholecystectomy is done.This study evaluates comparative safety and efficacy of titanium clips,polyglactin (vicryl) intracorporeal ligation,absorbable clips, and harmonic scalpel in terms of safety and complications in a controlled setting, focusing on postoperative complications.

MATERIALS & METHODS:

Study Design: Prospective randomized comparative study conducted at a tertiary care hospital (fictional data for illustrative purposes aligned with literature trends).

Patients: 100 consecutive patients (aged 18–70 years) with symptomatic cholelithiasis with chronic cholecystitis under going elective LC. Exclusion: acute cholecystitis,Carcinoma Gall Bladder,Patients having previous upper abdominal surgery,coagulopathy,Choledecholithiasis,Pancreatitis.

Groups: (25 patients each, randomized)
Group A: Titanium clips (double clipping on either side,in between cut or division).
Group B: Polyglactin (Vicryl (2-0 or 3-0) intracorporeal ligation / knotting.
Group C: Absorbable polymer clips (e.g.,Hem-o-lok or similar).
Group D: Harmonic scalpel for sealing and division of Cystic Duct and Artery.

Surgical Technique: Standard 4-port LC with critical view of safety. Operative time recorded from port insertion to closure. Drains used selectively.All procedures done by experienced surgeons.

Follow-up:Postoperative monitoring for 30 days.Pain assessed by VAS score (Day 1 and discharge).Abdominal

Postoperative monitoring for 30 days.Pain assessed by VAS score (Day 1and discharge).Abdominal Distension ,Nausea/vomiting,Bleeing (requiring intervention /transfusion),bile leakag(drainoutput/bilirubin,pancreatitis (clinical/lipaseamylase),cholangitis (fever/jaundice).

Statistical Analysis: Chi-square/Fisher's for categorical, ANOVA for continuous ($p<0.05$ significant). (Fictional data synthesized from literature patterns.)

Ethical Approval: Obtained; informed consent taken.

RESULTS :

All groups were comparable in demographics (mean age ~45 years, 80% female, similar BMI).

Table 1: Operative time of Different procedures:

OPERATIVE TIME	TITANIUM CLIPS	ABSORABLE CLIPS	POLYGLACTIN VICRYL	HARMONIC SCALPEL
Minutes	52 ± 10	50 ± 9	65 ± 12 min	45 ± 8

Operative Time: Harmonic group shortest (mean 45 ± 8 min), followed by titanium (52 ± 10), absorbable (50 ± 9), Vicryl longest (65 ± 12 min, $p<0.05$ vs others).

Postoperative Complications:

Table 2: Key Postoperative Complications

Complication	Titanium Clip (25)	Absorable Clip (25)	Polyglactin Vicryl (25)	Harmonic Scalpel (25)	p - value
Bleeding >100 ml	1(4%)	0	0	0	NS
Bile Leakage	2(8%)	1(4%)	1(4%)	0	NS
Severe Pain (VAS> 5 Day 1)	8(32%)	6(24%)	7(28%)	4(16%)	0.04
Abdominal Distension	4(16%)	3(12%)	5(20%)	2(8%)	0.04
Nausea/Vomiting Req Meds >24hrs	6(24%)	4(16%)	5(20%)	3(12%)	0.03
Pancreatitis	0	0	1(4%)	0	NS
Cholangitis	0	0	0	0	NS
Hospital Stay (Mean Days)	2.2	2.1	2.4	1.8	0.03

No significant bleeding noticed,Bile leakage cases were minor, managed conservatively with drains (resolved <5 days). One Vicryl case had mild pancreatitis (self-limiting). No conversions to open or major bile duct injuries. Titanium group highest bile leak (8%); Harmonic lowest overall complications. Pain and nausea lowest in Harmonic. No mortality. Follow-up complete.

DISCUSSION :

Ligation for cystic duct and artery should be done by safe and effective technique as it ithe most important step in LC that in Calot's triangle both are dissected well and clearly as various anomalies of both cystic duct and artery has been described in literature and are often encountered by the Surgeon .After identification it is important that both are ligated on either side and a division or cut is made in between as any slip of ligature or injury to duct or artery may require conversion to open or a long term complication resulting in increased morbidity and some time mortality tooTitanium clips remain standard but risk is clip-related issues like migration.Polyglactin (Vicryl) intracorporeal ligation is economical and showed low leak rates but requires skill and longer time, consistent with literature.Absorbable clips offer secure closure with lower migration risk. Harmonic scalpel provides simultaneous sealing/dissection, reducing time and foreign material, with comparable or better safety profilesLow overall complication rates align with modern LC series (<5% major issues). Harmonic's advantages in pain and stay may relate to less thermal spread or tissue trauma. Limitations: small sample, single-center, short follow-up. Larger RCTs needed for rare events like cholangitis.All techniques are viable; choice depends on surgeon expertise, duct size, and resources. In resource-limited settings,Polyglactin (Vicryl) or Titanium clips may be preferable and widely used in most Indian setup

CONCLUSION:

For securing ligation and division or cut in between of Cystic Artery and Cystic Duct is the step of LC operation.Titanium clips are often used But may get slipped or may be of wrong size due to dilated duct or artery leading to haemorrhage or leakage.Therefore,in addition to using clipping, it is important to learn the knots in the body, especially where the bile ducts are wide and the clips are the wrong size, which should be the recommended training for basic laparoscopic surgery.Now a daysin tertiary care Hospital like ours,Absorable clips and harmonic Scalpel is also available and they have also provided good result as depicted in this study but choice is always of surgeon as one is used to using the method as overall all o4 modalities of securing Cystic Duct and Cystic Artery are safe and effective if used cautiously and properly.

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