LAPAROSCOPIC STUDY OF HEPATOBILLIARY TRIANGLE AND ITS VARIATIONS IN PAKISTAN

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ABSTRACT
Objective: To assess frequency of the anatomical variations of boundries and contents of Hepatobiliary triangle using a laparoscope
Study design: It was a descriptive cross-sectional study.
Place and duration of study: This research work was undertaken in five teaching hospitals with required facilities and skillfull surgical team, from 8th Jan 2011-15th Jan 2014.
Methadology: convenient non-probabilty sampling technique was employed. This study was prospective evaluation of 500 patients ,including 350 women and 150 men, who underwent exploration of Hepatobiliary Triangle during laparoscopic cholecystectomy for different gallbladder diseases.Amongstthem388 patients with cholecystitis due to gallstones, and 112 with other gallbladder diseases like polyps, were analysed
Results: We documented variations in cystic artery-21%, cystic duct-18%, cystic lymph nodes-47%. Comparison and correlation of findings in male and female patients was made. Fat, fibrosis, adhesions was present more in Hepatobiliary triangles of female patients. No other differences were found between the sexes.
Conclusion: Laparoscopic surgeons must know variant anatomy of Hepatobiliary Triangle to avoid intraoperative damage to the blood vessels and the extrabiliary apparatus during Laparoscopic cholecystectomy**.**

Keywords: Laparoscopic Cholecystectomy, Variations, Hepatobiliary Triangle, Cystic artery, Cystic duct, Common hepatic duct. Cystic lymph nodes.

INTRODUCTION
Hepatobiliary triangle also called Calots triangular is a space formed between the cystic duct, the common hepatic duct and inferior surface of segment V of the liver1. It is the triangular space, which is dissected in Cholecystectomy to identify the cystic artery and cystic duct before ligation and division2.

Misinterpretation in the laparoscopic view increases the risk of intraoperative injury and postoperative complications 3. Appreciation of variations in the ductal and arterial anatomy of the triangle is of considerable importance during excision of the gallbladder. The knowledge of relevant anatomy is important for safe execution of cholecystectomy 4. It is very important for Laparoscopic surgeons to have sound knowledge of the anatomy of hepatobiliary area and its morphologic and topographic variations, to prevent injuy to boundaries and contents of Hepatobiliary Triangleduring exposure of Calottriaglein laparoscopic cholecystectomy which results in reduction of risk of postoperative complications 5.

Laparoscopic Anatomy is a new discipline in anatomy because of vast use of laparoscope in different branches of surgery. Laparoscopic surgery also called bandaid surgery or keyhole surgery or is a surgical technique of modern times 6.In this minimally invasive surgical procedure, 0.5–1.5 cm which small incisions are made in the abdomen compared to the extensive incisions required in laparotomy. The images of anatomical and surgical components in area of hepatobiliary triangle are magnified, which are then displayed on TV monitors and Keyhole surgery makes use of images in this procedure 7.This high magnification and resolution facilitates laparoscopic surgeons to have clear visualization of anatomical and surgical structures in the living human being 8.Small incisions, reduced hemorrhage, shorter hospital stay, shorter recovery time, reduced post-operative

morbidities like wound infections, no scrring, no incisional hernias, minimum post-operative pain, speed up recovery times, enhanced visual field for surgeons, same day discharge and reduced exposure of internal organs to external contaminants are potential benefits to Laparoscopic cholecystectomy. Videoscope surgical techniqueis new brand of Laparoscopic surgery which is prefered over primitive approach of abdominal surgeries 9. Ligature of the cystic artery and the cystic duct in hepatobiliary triangle is crucial step for the subsequent removal of the gallbladder. Incompetent execution of the procedure results in complications such as hemorrhage, leakage of bile into the peritoneal cavity, and portal vein thrombosis 10.

MATERIAL AND METHODS

After nessasary approvalby Advance Studies and Research Board (AS&RB),the institutional review board of University of the Punjab, this descriptive prospective cross sectional (hospital based)study was carried out in five teaching hospitals e,g Lahore General Hospital, Shaikh Zayed Hospital Lahore, DHQ Hospital Sahiwal, Mayo hospital, Jinnah hospital with best facilities for this research work and highly skillful Laparoscopic team available.

The patients were selected by non probability purposive technique. Sample size was calculated through Open-Epi website with level of significance 6%, margin of error 5% and frequency of 22.5%. All patients attending surgical out patients departments were examined with ultrasound before surgery. Exclusion criteria from study included empyema gall bladder Grade-I,II,III &IV gall bladder on laparoscopy, diabetes mellitus, hypertention or any other systemic disease patients having previous abdominal surgery, bleeding diathesis, patient not fit for general anaesthesia Surgical team comprised two consultant Laparoscopic surgeons, two surgical residents, two minimally invasive surgery fellows, and one attending surgeon/authorized Anatomist (myself).

The exploration of Hepatobiliary Triangle, observing evaluating and taking photographic evidence of its boundaries and its contents on endoscopic visualization was recorded by DVD recorder. Medical grade video monitor was used to display and document anatomical variations. Each observed anatomical variation was documented by photographs. Level of significance 5%(acceptable error 5%),margin of error 5% and frequency of 22.3 %.Confidence interval or confidence level =100-level of significance.

We evaluated boundaries, mutual relations of contents and variable morphological patterns of Hepatobiliary Triangle, using a laparoscope. Laparoscopic equipments were produced by Stryker.

DEMOGRAPHIC VARIABLES were documented as name, sex, age, father's name, clinical signs symtoms and ultrasound findings.

DPENDENT VARIABLES were taken asthose of laparoscopic findings during Laparoscopic cholecystectomy.

Cystic artery was studied under following groups,
Group I: Artery with in Calot's triangle.
Group II: Artery outside the Calot's triangle.
Group III: Compound cystic artery type.
GROUP1 includes
Ia: Single cystic artery within the Calot's triangle.
Ib: Double Calot's artery i.e. Two arteries identified in the Calot's triangle.

GROUP 2:

1. Cystic artery originating from the gastroduedenal artery, also known as the low lying artery.
2. Cystic artery originating from the liver bed.
3. Cystic artery originating from the variant right hepatic artery, also known as Moynihan's hump.
4. Cystic artery originating from the left hepatic artery.

Cystic duct was analysed under following subgroups,
Normal cystic duct,
absent cystic duct,
Short cystic duct ,
long cystic duct,
Double cystic duct,
spiral cystic duct,
Accessory cystic duct,
Adherent cystic duct
Cystic Node was demonstrated under following subheadings-
Identified in relation with artery and duct.
Unidentified in relation with artery and duct.
Cystic vein: Darkly stained not pulsatile vessel was identified around the Calot's triangle.
Moynihan's hump:
A right hepatic artery having a catterpiller turn in the Calot's triangle

RESULTS

Results of tree groups are summarized as single artery in Calot's triangle-76% which is a normal finding, 1b-Double artery in Calot Triangle -12.98%, II. Artery outside the Calot's triangle-6.2%,III.Compound type of

Artery one outside & other within the Calot's triangle-5%. Most common source of origin of the cystic artery was the right hepatic artery in 89%, least common sources observed were the left hepatic artery in 1% and the gastroduodenal artery in 1%.

Normal cystic duct was found in 79.88%. Absent cystic duct was noted in0.12%. Short cystic duct found in 8.96%.Long cystic duct 4.04%, Double cystic duct 1.85%. Spiral cystic duct- 3.15%,Accessory cystic duct-1.78%,Adherent cystic duct within the Calot's triangle 0.12%.

Variable relation of lymph node with artery. Cystic artery relation with Lymph node 54%.Cystic artery anterioinferior to cystic Lymph node. Cystic artery posterioinferior to cystic Lymph node. Other Contents, Moynihans hump found 2%.Cystic vein in 3%

DISCUSSION

It is apparent in our research work that proper exposure of Hepatobiliary Triangle during Laparoscopic Cholecystectomy is clinically important 11. According to our survey Caterpillar hump right hepatic artery, which is demonstrated 2% compared to 6% found previously. Also of interest in our study was double cystic artery documented as 12.98% which is consistent with previous work 12.It is of interest that an artery which is looking like the cystic artery in its course and relation and parallel to cystic duct was not really the cystic artery but was right hepatic artery 13. Caliber of the vessels to be divided is sourse of confusion and not a reliable index if it is the cystic or right hepatic artery. We acknowledge the fact that possible anatomic position and variations of the cystic artery are difficult to establish before surgery. We identified them only during disconnection of Calot'striangle and the gallbladder 14. Previously, an ergonomic emphasis has been that laparoscopic anatomy of the cystic artery could be considered as a precondition for performing safe laparoscopic procedures. This is our experience based statement that the variations of cystic artery often made us recognize an error, caused us to abscise incorrectly and, subsequently, leading to a hemorrhage. Previous studies have contained fewer reports on the laparoscopic classification of the cystic artery. Some have divided the cystic artery into low-lying cystic artery and cystic artery originating from variant right hepatic artery. Balija classified cystic artery variations into two groups 15. Group-A comprises five variations of the cystic artery within the hepatobiliary triangle: (a) normal position; (b)frontal cystic artery; (c) backside; (d) multiple; and (e) short cystic artery that arises from an aberrant right hepatic artery. Group-B consists of variations of the cystic artery that approaches the gallbladder beyond the hepatobiliary triangle. Our results show that 79.82%% of patients had normal anatomic configuration of cystic duct. Overall frequency of the cystic duct variants in our study was 21.18%. The most common variation observed in the study was short cystic duct (8.96%) which is consistent with other reported surveys[16].

CONCLUSIONS

- Significant variability in the contents of Calot's triangle is documented. Surgeons must be catious about these variations during Laproscopic Cholecystectomy.
- Accurate knowledge of these details may help in identification of the relevant structures in the right location at the right time and make very quick decision to proceed further with safe surgical approach
- Cystic lymph node is an important landmark in the assessment of exact location of cystic artery and cystic duct.
- These findings can help in understanding of systematic laparoscopic anatomy of Hepatobiliary Triangle; the study provides a clear and safe procedural approach to surgeon.

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