INNER VIEW ASSISTED FUNDUS FIRST RETROGRADE DISSECTION TECHNIQUE IN LAPROSCOPIC CHOLECYSTECTOMY FOR THE MANAGEMENT OF DIFFICULT GALLBLADDERS WITH FROZEN CALOT'S TRIANGLE: A PROSPECTIVE STUDY

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ABSTRACT: There are various techniques which are devised for dealing with the difficult gallbladders but in certain situations these techniques do not work because of dense adhesions at calot's triangle with distorted biliary and vascular anatomy with complete visual road block, so only viable option in such situation is to convert to open cholecystectomy. This "Inner view Assisted Fundus First Retrograde Dissection" (I. A. F. R. D.) Technique in laproscopic cholecystectomy is basically innovated to avoid conversion to open cholecystectomy in those situations where there is a frozen triangle of calot with no visible way out so that biliary and vascular injuries can be avoided and laproscopic cholecystectomy can be safely performed and all the benefits associated with minimal invasive surgery may be given to the patients. There is a subgroup of patients encountered intra-operatively with unyielding frozen triangle of calot and even if it is converted to open cholecystectomy the result is not better than I. A. F. R. D. Technique because in this there is a magnified view and outer dissection and its extent is guided from inside the lumen of gallbladder and intra-corporeal suturing and knotting is also taken under vision leaving behind no residual stump and thus avoiding the complications associated with residual stump of gallbladder. In this study of 53 patient on the basis of intraoperative findings of frozen calot's triangle who underwent "Inner view Assisted Fundus First Retrograde Dissection" technique in laproscopic cholecystectomy over a period of 3 year. The 53 patient are operated by this technique. Among these 31 patient are male and 22 female with age group varying from 43-74 year, majority are above 58 year, 23 patient are of low socioeconomic status, rest are middle and lower middle class, 15 patient are of far off areas and 9 patient have history of abdominal surgery (7 lower and 2 upper abd.) All patients are comparable in their demographic data, clinical, laboratory and imaging parameters. All patients are operated by standard four port technique. All are having intraoperative findings of frozen triangle of calot with associated other findings. There is only one conversion to open cholecystectomy due to acute xanthogranulomatous cholecystitis. Operating time ranges from 45-98 minute, return to normal activities within 3-5 day, postoperative hospital stay is 3-5 day. Thirteen patient have postoperative complications including five port site infections due to infected gallbladder retrieval, three patient have post-operative biliary leaks from liver bed and seven patient have mild systemic infection which settled with antibiotics, no patient has bile duct injury or intraabdominal collection. The laproscopic "INNERVIEW ASSISTED FUNDUS FIRST RETROGRADE DISSECTION TECHNIQUE" is a very effective, precise and safe technique and a very viable alternative to conversion to open cholecystectomy in case of difficult gallbladder with frozen calot's triangle with distorted biliary and vascular anatomy.

KEYWORDS: Innerview, Fundus, Retrograde Dissection, Technique, Frozen Calot's Triangle, Visual Road Block, Laproscopic Cholecystectomy.

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INTRODUCTION: The creator has created the mankind with the best innovative brain faculty which always innovates the new ideas to achieve new horizons which are then embodied into a practical shape and can be utilized for the benefit and survival of the mankind Surgery is an ever changing art and the new heights that it has achieved today is only because of the innovative and research work of the pioneer surgeons.

Many new techniques and technical modifications are on the way to make the difficult surgeries and procedures easier for the surgeons dealing with the various minimal access procedures and satisfactory for the patients for smooth and early recovery, shorter hospital stay and low post-operative morbidity and mortality.

Laproscopic cholestectomy has revolutionized the whole world in the management of cholelithiasis as it is the most commonly performed laproscopic surgery in the world and because of the introduction of new innovative techniques and increased experience with the procedure more difficult and complex gallbladders can now be managed laproscopically which were used to be managed by open surgery, therefore it does not need any special mention.

During initial evolutionary phase of laproscopy only simple gall bladder surgeries were used to be done laproscopically but now a days with the improved techniques

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and technology and surgical expertise, even very difficult gallbladders can be successfully done laproscopically without any bar of time and stage of cholecystitis.^{[1],[2]}

As for now the laproscopic cholecystectomy can be safely declared as gold standard line of management for dealing with any kind of benign gallbladder disorder.^[3] At the begining surgeons would like to feel comfortable in dealing with the simple gallbladder surgeries but with the increase in expertise and introduction of new armamentarium, difficult gallbladders are being now dealt with ease. However, before going to deal with the inflammed gallbladders, the skill of the surgeon, experience in laproscopic techniques and thorough knowledge of risk factors and anticipation of any complication arising out of difficult surgery are collectively important for a safe surgical outcome.^[4]

Even in the present era of advanced laproscopy, the laproscopic surgeons should have a low thre should for conversion to open technique in case of a difficulty. We strongly beleive, from our experience in dealing with these inflammed gallbladders, that every gallbladder is a book in itself which needs to be read time and again for a better outcome and also looking at the literature, the difficult thing to understand is to define the word difficult "Gall bladder". However, we believe difficulty is a relative term and there are certain general principles that need to be followed before undertaking the laproscopic cholestectomy.^[5]

The aim of the operating surgeon should not only be giving the benefits of minimal access surgery to the patient but also avoiding the intraoperative and post-operative complications. The laproscopic cholestectomy is one of the commonest procedure performed globally so erros are commonly reported and these can be minimized with the experience and utmost care during procedure and with the knowledge of the relevant techniques to deal with the difficult situations arising out during managing difficult gallbladders. The beginners should start from simple gallbladders and as the learning curve of the surgeon graphically increases he can then start to deal with the difficult cases.^[6]

Difficult gallbladder is a relative term and no gallbladder is as easy as thought of because there is only one common bile duct which should be protected at any cost. So in my view any pathological condition of the gallbladder associated with frozen calot,s triangle with distorted biliary and vascular anatomy, fibrotic and inflammed thick walled gallbladders as well as those having adhesions with surrounding structures or having associated liver cirrhosis with portal hypertension are difficult gallbladders.

There are various techniques which are devised for dealing with the difficult gallbladders but in certain situations these techniques do not work because of dense adhesions at calot,s triangle with distorted biliary and vascular anatomy with complete visual road block, so only viable option in this situation is to convert to open cholestectomy.

This "Innerview Assisted Fundus First Retrograde Dissection" Technique in laproscopic cholecystectomy is basically innovated to avoid conversion to open cholestectomy in such situations where there is a frozen triangle of calot with no visible way out so that biliary and vascular injuries can be avoided and laproscopic

cholecystectomy can be safely performed and all the benefits associated with minimal invasive surgery may be given to the patients.

Even if, we convert to open cholecystectomy there may be partial cholecystectomy or residual stump remains there and in I. A. F. R. D. Technique due to magnified view and outer dissection is guided from inside the lumen so chance of residual stump is minimal. so it is more effective then Open cholecystectomy.

This technique is being practiced by me for the last 3 year and it has made the conversion rate very low which are due to frozen callots triangle. and distortion of biliary and vascular anatomy. To practice this technique one should be well versed with intracorporeal suturing and knotting technique which is mandatory for this technique. The basic aim of this technique is to lower the conversion rates in difficult gallbladders and to avoid the biliary and vascular injury when the anatomy at calot,s triangle is distorted and to give the benefits of minimal access surgery to such patients.

MATERIALS AND METHODS: This study comprises of the patients operated in Dept. of surgery GMC. Jammu and in a Corporate hospital in Jammu, J and K India. Over a period of three year from Jan. 2012 to Jan. 2014 and further follow up of six months. A total of 53 patient of difficult gallbladder with frozen calot,s triangle with distorted biliary and vascular anatomy has been selected for the procedure. All the patients of difficult gallbladders which are manageable by alternate techniques of gallbladder dissection are excluded from this technique. Patient selection is only on the basis of intraoperative findings of frozen calot,s triangle with dense assimilated adhesions with complete visual road block with ill-defined biliary and vascular anatomy. So to avoid conversion to open cholecystectomy.

Details of Data Recorded Includes: Demographic details, history of the patient, clinical findings and severity, counts, liver function tests, renal function tests, radiological findings, timing of cholecystectomy, duration of surgical procedure, conversion rate, complication rate, mortality, length of hospital stay, any other relevant investigation and follow up.

METHODS: The laproscopic cholecystectomy has been carried out under general anaesthesia with patient positioned supine. All patients received routine prophylactic antibiotics as per our institute,s surgical site infection prevention protocol. The position of the 4 ports are as for standard laproscopic cholecystectomy. These are sited at the umbilicus (10mm), subxiphoid (10mm) and 2 over the rt. Subcostal area 5mm each at midclavicular and midaxillary line. Pneumoperitoneum created. Initial diagnostic laproscopy was done findings confirmed and intraoperative decision is made to proceed as a routine or to apply our innovative "INNERVIEW-ASSISTED FUNDUS FIRST RETROGRADE DISSECTION TECHNIQUE". This technique is used when anatomy at calot,s triangle is distorted and dissection is risky due to unyielding dense adhesions and impending risk of injury to biliary and vascular structures.

TECHNIQUE: This is the new innovative technique used for frozen calot,s triangle where there is complete visual road block and impossible to proceed further.

Step 1: Clear the adhesion of gallbladder with adjacent structures.

Step 2: Fundus is hold and fixed and with the help of puncture needle attached with suction machine, bile and other contents are aspirated to avoid spillage.

Step 3: Fundus is fixed and with the help of hook attached with monopolar diathermy a hole is made and a 5mm canula is inserted and contents aspirated.

Step 4: Hole in fundus is further enlarged and now 10mm suction canula inserted and stones are removed with it and also with the help of cup until whole cavity of gallbladder is evacuated without spillage of stones.

Step 5: Cavity of gallbladder is cleaned with suction and irrigation with normal saline and inside of the gallbladder inspected thoroughly and now incision on the anterior wall of the gallbladder extended till the tapering of gallbladder to cystic duct just approximately 5mm above its junction with cystic duct.

Step 6: Now strictly keeping the inside view retrograde dissection is started from the fundus, our outside dissection is guided from inside the cavity of gallbladder with precision of lower extent because no biliary or vascular structure may violate the cavity of gallbladder when we are keeping at least 5mm above the last lower extent.

STEP 7: Now still gallbladder intact take a transfixing suture with vicryl 2-0 starting from medial to lateral and lateral to medial a horizontal mattress type of suture and then knot it tightly. The skill of intra corporeal knotting and suturing is mandatory for this technique.

Step 8: Sometimes there is a special situation where we cannot dissect out the gallbladder from its bed e. g. In case of cirrhotic liver with portal hypertension, fibrotic intrahepatic gallbladder where chance of sinus bleed is increased, the posterior wall is left intact and mucosectomy or fulguration of mucosa is done.

Step 9: Postoperatively copious saline wash and irrigation is done and all saline is sucked out, a white guaze piece is taken and placed over gallbladder bed for five minutes and look for any bile staining to rule out any biliary leak and then remove the guaze piece. Gallbladder is bagged before retrieval to avoid port site infection. Subhepatic drain is placed which is usually removed after 24-48 hours.

RESULTS: This study is conducted in the dept. Of surgery in GMC Jammu and in a corporate hospital J and K, India. In three year w. e. f. Jan. 2012 to Jan. 2014 with further follow up of six month. All the difficult gallbladders which are not manageable by other techniques are included in this study. It is on the basis of intraoperative findings of frozen calot,s triangle with distorted biliary and vascular anatomy with complete visual road block unmanageable by other techniques and conversion to open is the only option in those situations where we use this innovative technique. A total of 53 patient have been operated by this "Inner view assisted fundus first retrograde dissection" technique. (I. A. F. R. D. TECHNIQUE).

Among these 31 patient are male and 22 patient female. Age group varies from 43-74 year. Majority of the patients are above 58 year. 23 patient are of low socioeconomic status rest are lower middle and middle class. Fifteen patient are belonging from far off areas with minimal medical facilities.

Most of these patients have long history of symptoms of recurrent attacks of acute cholecystitis (39 PATIENT).

Seven patient have history of lower abdominal surgery one had hydatid liver surgery and one patient operated for liver abcess twenty five year back, Thirteen patient have associated co-morbid conditions, forty patient are ASA-1 and thirteen patient ASA-2 none are of ASA-3 and ASA-4. All patients are comparable in demographic data, clinical, laboratory and imaging parameters.

Total pts.	53	
Age	43-74	57.3±15.7
Male/Female	31/22	58.49/41.50%
Far off areas	15	28.30%
Very poor	23	43.39%
Recurrent cholecystitis	39	73.58%
Co-morbidity	13	24.52%
Diabetes	7	13.20%
Hypertension	12	22.64%
Hypothyroidism	5	9.53%
Copd	3	5.66%
Abd. surg. upper and/lower ASA-1/ASA-2	2 7 40/13	3.77%/13.20% 75.47/24.52%

Table 1: Patient Characteristics

HB(mg/dl)	9.5±2.3
White blood cell count	8.3±5.6
Platelets count	140±71
Blood urea	38±12
Blood cretinine	1.4±0.8
S. Bilirubin	0.8±0.6
S. alkaline phosphatase	180±12
SGOT(IU/l)	30±26
SGPT(iu/L)	40±20
Total protein(gm/dl)	8.5±1.5
S. albumin(gm/dl)	4.2±0.3
S. amylase	40±30
PTI	85±7
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Table 2: Laboratory Data

1	Dense adhesion at calot,s triangle with distorted biliary and vascular anatomy	53 (Total)
2	Fibrosed ,contracted gallbladder	18(33.96%)
3	Inflamed thick walled gallbladder	11(20.75%)
4	Gangrenous gallbladder	3(5.66%)
5	Empyema gallbladder	2(3.77%)
6	Mucocele of GB	5(9.43%)
7	Mirrzi,s syndrome type-1 and type -2	2(3.77%)
8	Cholecystoduodenal fistula	1(1.88%)
9	Chronic cholecystitis with liver cirrosis	3(5.66%)
10	Chronic cholecystitis with giant stones >4cm	3(5.66%)
11	Small fibrosed GB (MaKHI GB)	4(7.54%)
12	Xanthogranulomatous cholecystitis	1(1.88%)

Table 3: Intraoperative Findings

1	CHARACTERISTICS	
2	Operation time	(45-98 min.) 71.52±26.02
3	Conversion rate	1(1.88%)
4	Hospital stay	(3-5 days)2.75±0.94
5	Return to normal activities	(3-5 days)2.95±0.83
6	COMPLICATIONS	13(24.52%)
7	Port site wound infection	5(9.43%)
8	Biliary leak	3(5.66%)
9	Bile duct injury	0(0%)
10	Systemic	7(13.20%)
Table 4: Surgical Outcome		

Analysis of Surgical Outcome: All the fifty three patient in this study have intraoperative findings of frozen triangle of calot with distortion of biliary and vascular anatomy with no visible outway and associated other findings as shown in Table no. 3. Operating time ranged from 45-98 minute (71.52±26.02), return to normal activities within 3-5 days (2.95±0.83), hospital stay is 3-5 day (2.75±0.94).

There is one conversion to open cholecystectomy because of acute xanthogranulomatous cholecystitis with adherent tranverse colon and omentum. All the rest of patients are completed by standard 4 port technique. In 13 patient we have post-operative complications detailed in Table 4. The 5(9.43%) patients have port site wound infections which is due to retrieval of infected gallbladders and settled within 7-14 day without any further consequences. Three patient (5.66%) have postoperative biliary leaks most probably from liver bed which spontaneously stopped within 3-5 day. There is no bile duct injury. Seven patient have systemic infections which responded to antibiotics and settled spontaneously. There is no mortality or any serious complication and post-operative recovery has been smooth and uneventful in most of these patients.

DISCUSSION: Safety save is a gold principal in handling of surgical or operative procedure. A good navigator knows the trick of saving himself from the tides of misfortune. The risk is an inherent part of surgical play and cannot be avoided but can be dealt with meticulously if anticipated in time and if one has the available experience and required equipments to deal with the presenting complications.

There are various techniques which have been devised by surgeons to deal with different difficult situations while performing of difficult gall bladder surgeries to avoid biliary and vascular injuries.^[7,8,9,10] So when there is a frozen calot,s triangle with complete visual road block with distortion of biliary and vascular anatomy one should not hesitate to convert to open or to use some innovative technique to avoid complications and conversion to open cholecystectomy and to give benefit of minimal access surgery to patient in such situation Inner view assisted fundus first retrograde dissection technique (I. A. F. R. D. Technique) is a very effective and a safe tool for emergency salvage as well as to complete the surgery laproscopically giving all the benefits associated with it to the patient. Based upon the intraoperative findings, gall bladders can be divided into four categories 1n accordance with the anatomy at calot,s ttriangle.

and each category is managed differently with some modification in the concerned technique

Class -1 clear anatomy Class -2 anatomy discernible after dissection Class-3 anatomy discernible after difficult dissection Class -4 anatomy and structure may be impossible to identify (Frozen calots Class-3 occasionally required to convert to open cholecystectomy or Innerview Assisted Fundus first retrograde dissection technique but class-4 is a definite indication for conversion to open cholecystectomy or (I. A. F. R. D TECHNIQUE) as there is no visible way out.

So in this situation we use the "INNERVIEW ASSISTED FUNDUS FIRST RETRO GRADE DISSECTION" TECHNIQUE which is a very safe technique because our outer dissection is guided from inside view of the gall bladder lumen which is clearly opened to its junction with the cystic duct and dissect the gallbladder from its liver bed just 5mm above its junction with the supposed cystic duct or visible last extent of the lumen of gallbladder from inside to avoid any inadvertent biliary and vascular injury.

But there may be concern regarding the spillage of bile and stones in the concerned technique but this can be avoided if we proceed step by step. first fix the fundus of gall bladder and make a hole with energised hook and put 5mm canula to suck the bile or any other contents then enlarge it as soon as stones start coming out either retrieve them with the use of a cup or 10mm suction canula and so completely make the gall bladder empty and wash the lumen with normal saline by continous irrigation and suction so that lumen is crystal clear and then extend your incision just 5mm above where Hartman,s pouch tappers to cystic duct, after irrigation and suction the lumen of the gallbladder will be clearly visible now starts the reterograde dissection from the fundus of gallbladder under the guidance of inner view of lumen of gallbladder just 0.5-1cm above the last extent of visible lumen Even though there is a spilage of bile or stones it does not make much difference if we wash and retrieve the stones properly as various studies have shown that complications may be there but they are not so much serious.^[11,12,13,14,15,16]

Second concern is that of residual stump and complications associated with it but if this technique is properly done chances of residual stump is minimal and also by doing open cholecystectomy you cannot do better than this. But in this technique you have magnified view and dissection extent is almost complete and concern regarding residual stump or partial cholecystectomy and associated stump syndrome, stumpcholelithiasis and stump cholecystitis can be avoided.^[11,17] Most of the complications in difficult gallbladder occurs when surgeon fails to anticipate anatomical distortions at calot,s triangle because of acute or chronic inflammations and dense adhesions.^[8,9,10]

In such situation pressure hydrodissection, blunt and sharp dissection and peanut guaze dissection are useful tools. "Innerview assisted fundus first retrograde dissection" technique is useful when there is distorted anatomy at calot,s triangle due to recurrent inflammatory attacks, small contracted fibrotic gallbladders, thickwalled inflammatory gallbladders, chronic cholecystitis with giant stones >3cm, cholecystoenteric fistula, cirrotic liver with chronic cholecystitis, intrahepatic gallbladder, Mirrizi,s syndrome type 1 and 2, in all these situations I have successfully applied this technique with safe surgical outcome.

In certain situations like cirrhotic liver with portal hypertension, inflamed thick walled gallbladder adherent to liver, or fibrotic gallbladder there is increased chance of bleeding from liver bed in such situation the wall of GB is left in situ and mucosectomy or fulguration of mucosa is done.

In case of cholecystoduodenal fistula this technique can be used safely. open the gallbladder, dismantle the duodenum and close the perforation with 2-0 vicryl intracorporeally. In case of giant GB stone sometimes cystic duct is obliterated, do cholecystectomy by this technique without transfixing and place a subhepatic drain only and come out.

Before starting with this technique any gallbladder with frozen Calot's triangle I used to convert to open cholecystectomy but now I am doing such gallbladders successfully and safely with this technique. Any gallbladder whose fundus is available can be done by this technique. I have successfully and safely done a series of fifty three patients by this technique and as no data is available in the literature regarding this technique.

So it needs further series to justify its place in the management of difficult gallbladders always there is a variability in experiences and skills of different surgeons so no technique is comparable to experience.

CONCLUSION:

1. The laproscopic INNERVIEW ASSISTED FUNDUS FIRST RETROGRADE DISSECTION TECHNIQUE is very effective, precise and safe technique and a very viable alternative for conversion to open cholecystectomy in case of difficult gallbladder with frozen Calot's triangle with distorted biliary and vascular anatomy.
2. Biliary and vascular injuries can be avoided
3. Conversion rates can be lowered down.
4. It is not a difficult technique to master provided anyone know intracorporeal knotting and suturing.
5. LESS time consuming with experience.
6. So when you decide to convert to open, don't open just open the fundus of gallbladder and proceed.
7. Always there is a variability in experience and skill of different surgeons, so no technique is comparable to experience.
8. The intrinsic errors are inherited in surgical techniques and cannot be avoided and whenever these happen, open approach should always be given preference.

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