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Presentation of an original technique



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Laparoscopic cholecystectomy: technical compromise between French and American approach. Presentation of an original technique

INTRODUCTION: *Laparoscopic cholecystectomy (LC) is a well standardized technique. There are two main approaches, proposed by French and American Schools. They have similar operative times, but different arrangements for site ports insertions and for patients and operators' position at operative bed. Although we can foresee new scenarios for the next future (robotics, SILS, NOTES, minilaparoscopy), it seemed interesting to describe a simple variation to LC introduced in the last years in our experience relative to the positioning of operators and patient during standard American technique.*

METHODS: *In a retrospective analysis of 140 patients operated on for LC in the last two years (70 with French technique and 70 with "American modified" technique) we compared the following parameters: laparotomic conversion, duration of operation, hospital stay, morbidity and mortality rates.*

RESULTS: *Conversion to laparotomy, length of operative time and hospital stay were similar. Morbidity rates were slightly different, but it did not show statistically significant differences between the two groups. Mortality was nil.*

CONSIDERATIONS: *Our variant to LC seems to be almost a compromise between the two main techniques. Our operators' arrangement gave a greater comfort for surgeons during LC and our results were similar to those reported with adoption of French and American approaches. These considerations led us to judge our variation safe and reliable.*

KEY WORDS: Gallbladder lithiasis, Laparoscopic cholecystectomy, Operators' position, Original technique.

Introduction

Laparoscopic cholecystectomy (LC) was towing the spread and success of laparoscopic surgery, sometimes even being, wrongly, identified with it. The highlighted

advantages of LC and the constant improvement of equipment and instruments have enthusiasm and such unanimous consensus among surgeons that its adoption is now overwhelming. To date, the CL is undeniably the "gold standard" for the surgical treatment of diseases of the gallbladder. Even some conditions which in the past was considered absolute contraindications to LC (i.e. Mirizzi's syndrome, situs viscerum inversus)¹⁻⁶ are now approached with laparoscopy, so that open surgery is limited to selected cases, sometimes even using minilaparotomic techniques⁷.

The laparoscopic technique is now standardized as described by the two major Schools, the French one⁸⁻¹⁰

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and the American one ^{11,12}, which, always maintaining the same sequence of operative time, are differentiated by the position of trocars, of patients and operators. The choice to execute one or the other technique is often related to the theoretical training and the operator's habit rather than to real clinical indications.

Although there are changes to these techniques, in reducing number and size of the trocar, in using a single access or natural orifices for the insertion of surgical instruments, we felt it was still interesting to report a simple modification that we have made in the last years in our experience and that can represent almost a compromise between French and American techniques, summing their own advantages.

Material and methods

140 cases operated on LC in the last two years were selected for uniform characteristics with respect to age, sex, BMI, ASA score, mode of admission (elective or emergency), presence of complications of gallstone formation (previous cholecystitis or acute pancreatitis), previous surgeries upper abdomen. All operations were performed by surgeons (AR, MS, NC, CA and GR) with experience of over 100 procedures for minimally invasive surgery.

TABLE I - Clinical characteristics of the 100 patients included in the study

	Group A (70)	Group B (70)
Age median (range)	48 (19-75)	51 (21-84)
Sex (male:female ratio)	1:1,7	1:2,1
BMI		
<25	8	11
25-30	31	28
31-35	29	28
>36	2	3
ASA score		
I	25	24
II	34	36
III	11	10
IV	0	0
Mode of admission:		
Elective	59	61
Emergency	11	9
Presence of complications of gallstone formation:		
previous cholecystitis	18	20
previous acute pancreatitis	8	7
Previous sovramesocolic operations	3	3

Patients were divided into two groups: a) 70 patients operated on "French" technique (operators: AR, MS, CA), b) 70 patients on "modified American" approach (operators: NC, GR) and their characteristics have been synthesized in Table I.

DESCRIPTION OF TECHNICAL CHANGE

The change we have made is a compromise between the French technique for the surgeons' position at the table, and the American approach for the arrangement of the trocar (Fig. 1).

The patient is positioned supine on the operating table. The head rests on a headboard gel. The right upper limb rests on a holder-arm padded, fixed in position abducted of less than 90°, while the other arm is left along the body. The legs are spread apart and are placed on the leg-holding at the same level of the body.

The patient is placed in anti-Trendelenburg 10-20° and rotated on the left side. The bed is kept so that the surgeon can operate with the shoulders completely relaxed and elbows bent at more than 90°. The video column is placed at the right shoulder of the patient. The operator is to the patient's left and the first assistant that holds the camera between patient's legs. The second assistant, if present, should be to the right of the patient.

The arrangement of the ports is that provided by the American technique with the first optical port at the navel, the operator port from 10 mm below the xiphoid to the right of the round ligament, a 5 mm port is inserted along the right anterior axillary line and the fourth 5 mm port in the right hypochondrium, along the chondro-costal margin, on the right mid-clavicular line, in correspondence with the projection of the junction between the cystic duct and common bile duct.

LC is conducted on operative time universally standardized. The gripper used to grip the bottom of the gallbladder is introduced through patient's right side port and moves the bottom of the gallbladder upwards and to the right, lifting the lower face of the hepatic right lobe. A second gripper, manoeuvred by the operator through the emiclavicular port, grabs the infundibulum of the gallbladder pulling it down and to the right, to increase the distance between the cystic duct and the common hepatic duct so to open the triangle of Calot and to identify cystic duct and common bile duct.

The dissection begins at the junction between infundibulum and the cystic duct with an instrument inserted through the 10 mm port. The peritoneum is incised anteriorly, a few millimeter from the reflection of the peritoneum on the liver at the intermediate portion of the body of the gallbladder. It then progresses to the gallbladder-cystic duct junction. The same procedure is then carried out on the back of the gallbladder. Once identified, cystic duct and artery are clipped close to infundibulum. The intervention is then completed with

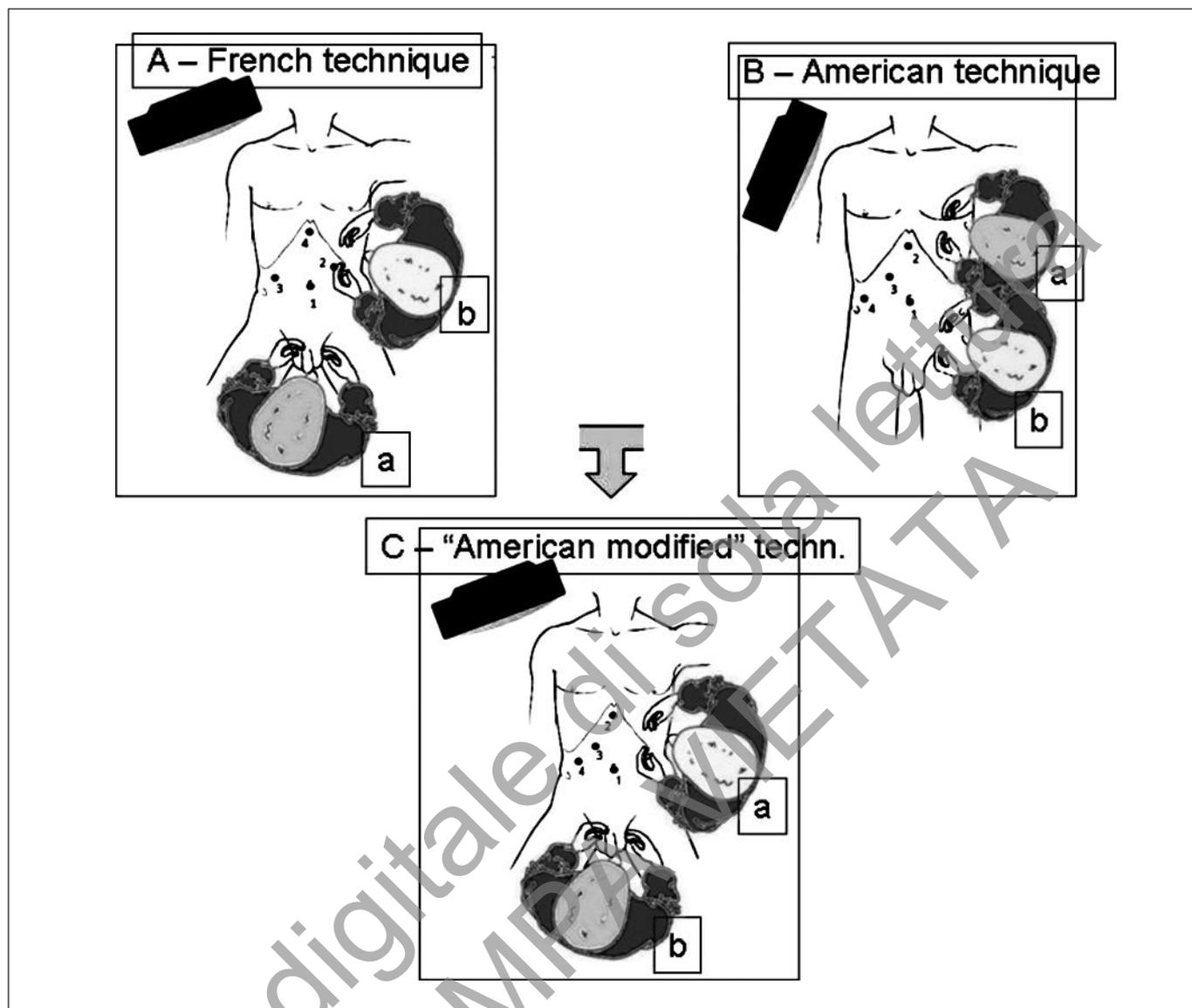


Fig. 1: Comparison between French technique (A), American (B) and our modification (C) in the position of operators, patient and trocar. Legend: a). operator, b) first assistant. 1). 10 mm optical port, 2). 10 mm operator port. 3). and 4). 5 mm ports

the dissection of the gallbladder from the liver bed, the control of hemostasis, the positioning of drainage and the extraction of the gallbladder through the umbilical incision and suture of incisions.

Laparotomic conversion, operative time, hospital stay, complications and mortality rates were compared in the two groups. To evaluate the postoperative period and type of morbidity observed was used the classification system for surgical complications of Clavien-Dindo ¹³.

Results

Operation time group a 42' (range 25'-125') vs. group b 50' (30'-140') were almost similar, as well as the post-

operative hospital stay group a: 2.5 days (1-9) vs. group b 2.5 days (1-10)

During surgery occurred a total of 10 bleeds (7.1%): 3 from the hepatic bed (2 patients in group a and 1 patient in group b), 3 for lesions of glissonian capsule (1 patient in group a and 2 patients in group b, 1 of them required transfusion), 2 for cystic artery lesion (1 in group a and 1 in group b) and 2 from the site of port insertion (1 in group a that required transfusion and reoperation and 1 in group b). Laparoscopic conversion were needed in three cases, for haemorrhage during the isolation of cystic artery lesion (group a) and for tenacious adhesions limiting the dissection in other 2 patients (1 group a and 1 group b).

The gallbladder was accidentally punched in 3 cases (1

TABLE II - Evaluation of complications observed according to the classification system of surgical complications of Clavien-Dindo ⁶

Grade		Group A	Group B
I	Any deviation from the normal postoperative course without the need for surgery, endoscopic and radiological interventions. Regimens allowed: drugs as antiemetics, antipyretics, analgesics, diuretics, electrolytes, and physiotherapy. This grade also includes wound infections opened at the bedside	5	6
II	pharmacological treatment with other drugs than for complications grade I. Blood transfusions and total parenteral nutrition	1*	1
IIIa	Surgical, endoscopic or radiological treatments not under general anesthesia	1	0
IIIb	Surgical, endoscopic or radiological treatments under general anesthesia	2	1
IV	Onset of life-threatening complications for the patient	0	0
V	Exitus	0	0

*Occurred in one patient included in IIIb too.

group a and 2 group b). Three patients (2 in group a and 1 group b) with bile leakage due to dislocation of the clip from the cystic duct were treated endoscopically. In one case there was the resolution with biliary stent placement, in the others (1 group a and 1 group b) the failure of endoscopic procedures and the onset of bile peritonitis imposed a laparotomy.

The severity of complications according to the classification of Clavien-Dindo is schematized in Table II. Mortality was nil.

Discussion

More than 20 years after the first LC one can see new and seductive future scenarios, such as NOTES, robotics or technical devices which provide for the reduction of the caliber and/or number of accesses (SILS, minilaparoscopy) ¹⁴⁻²¹. In such a context it could seem pleonastic and anachronistic to talk about changes to the commonly adopted videolaparoscopic techniques. Certainly is not so; the innovative procedures, in fact, are attractive, but they still limited diffusion for technical difficulties, for teaching-learning system or for excessive costs. Today, therefore, these procedures must be considered undoubtedly minority compared to the standard technique of LC (LSC) for their diffusion, so they can not currently replace LSC. Particularly SILS or NOTES require scientific confirmation that does not seem possible in the short term. The time required for the execution of these procedures is longer and more complications are reported than those seen after LSC without significant advantages in terms of patient's satisfaction, post-operative pain and quality of life. It should be stressed that there seems to be an increase in the rate of biliary duct injury during SILS compared to historical rates recorded during LCS and that extreme caution is recommended to adopt

these techniques for acute cholecystitis ^{22,23}. However, further controlled studies are needed to draw conclusions concerning the safety of SILS and NOTES and to assess their real advantages.

Robotic surgery is fascinating, but it is too expensive to be adopted in all centres and thus remains limited to a few institutions. An expense that does not seem justified especially for divisions in which laparoscopic technique is limited to a small number of interventions. The experiences of "three trocar cholecystectomies" reported by more authors can be proposed for "easy" gallbladders and are the prerogative of skilled surgeons. Such attempts have well-known limitations (difficulty of exposure of Calot, need for external artifice as an application point of traction for the gall bladder) and expose the surgeon to unjustified additional difficulties in the face of minimal benefit such as saving a single 5 mm incision. The use of small diameter instruments, the so-called minilaparoscopy (MLC), designed to further decrease nervous and muscular traumas and improve aesthetic results, neither was a great success and is indicated in the small group of patients (young and thin). The instruments also are particularly delicate and easily damaged ²⁴. In two meta-analysis of studies comparing LSC and MLC operation time and conversion rates would seem better with the LSC, while the MLC seems to provide little less pain and better cosmetic results ^{25,26}. For these reasons, for some years LSC will remain the reference for cholecystectomy and will be the first "step" in the approach to laparoscopic surgery.

In this varied scenario the standard technique still maintains its central role as a reference method for the LC and as a first step in the education system of minimally invasive surgery and hence the appropriateness and legality of our investigation and our proposal.

Coming now to the specific merit of the two coordinates to be examined, they are basically represented by

the spatial distribution of the surgeons on the position beside the patient and the arrangement of the ports in relation to the abdominal area.

As previously reported, there are two main techniques universally adopted for LSC: the French, promoted by Mouret (Lyon), Dubois (Paris) and Perissat (Burdois) and the Anglo-Saxon, promoted by Reddick and Olsen (Nashville, USA) and Cuschieri (Great Britain). The technique described in France provides the surgeon between the spread legs of the patient and first and second assistant respectively to the left and to the patient's right. In American technique, instead, the patient is supine with closed legs and the surgeon is on patient's left with the second assistant on patient's right side and the first assistant holding the camera to the surgeon's left. The key difference is in the port position. The 10 mm operator port in French technique is on the left of patient's midline and above the transverse umbilical line, while in the American one is in the epigastrium right below the xiphoid. The assistant's traction on the bottom of the gallbladder is consequently exerted from a different position in the two techniques, namely by the epigastric port in the French and by the right lateral one in the American. In both procedures the surgical tactics for traction on the gallbladder, exposure of Calot, isolation of the elements before clips application are similar. The proponents of each of the two techniques consider that some maneuvers can be simpler in one respect to each other. Often the surgeon's preference for one of the two methods is related to School grounds or to the habit of repeating the same movements or to the principle, in truth fundamental in surgery, for which the adoption of similar movements in similar phases of an intervention, reduces the errors and the tissue trauma and increases the speed of execution with undoubted advantages for the surgeon and for the patient. In literature is not given to find a study that allows to state that one of them is associated with a lower risk of biliary lesions or other type of major complications²⁷, although Perissat²⁸ asserted that, following the various traction mode of the gallbladder in the American technique (the liver is retracted by axial traction on the gallbladder through the anterior axillary port and the infundibulum through emiclavate access), you could increase the risk of bile duct injuries. In one randomized trial that compared these two methods the only parameter in favor of 'French' technique was the least impact on lung function post-operatively²⁹

Our proposal tries to unify the technical characteristics of both approaches that we found advantageous on technical view point, combining French patients' position at the table with American port disposition. In particular with the American arrangement of ports the operator instrument in the surgeon's right hand falls perpendicularly to the cystic duct and artery, so that both dissection of elements and, above all, in our experience, the application of clips are easier. The first assistant, hold-

ing the camera, controls just one abdominal quadrant (the upper right), varying minimally the field of view, and this advantage is even more apparent using a 0° optic system. With our change putting the first assistant between the patient's spread legs rather than on the operator's left side, we noticed a minor hindrance of movements between surgeons. Unlike working shoulder to shoulder (as in the prior American standard), you can create interference between operators, especially in the case of surgeons particularly stout or too long interventions. It should also be emphasized that this change is useful if the operative field there are only two surgeons in the absence of a second assistant. In this case it is easier for the first assistant to maneuver the instruments introduced through the lower right side port, being in the most ergonomic position to use his left hand without having to implement uncomfortable rotations with the bust. In French technique if there are only two operators necessarily occurs a cross between operator's left arm and assistant's right arm using the instrument positioned below the xiphoid.

In surgery, the success of an intervention depends on several variables. Knowledge and technical skills of the operator and of the team are fundamental and essential, as well as the standardization of the technique, the adequacy of the instruments and, in this case, the correct position of ports and of surgical team. Port incisions too close from each other; instruments that operate at wrong angles, personnel's inadequate positions can therefore create uncomfortable and unsafe working conditions. Besides these variables, we must take present also some errors "external" to the operating field, which can be 2-3 times more frequent than those of surgical technique. Safety studies in other fields of work suggest that attention to these "external" incidents can be important in reducing the risk of catastrophic failure^{30,31}. In this sense, several studies systematized the possibility of error in surgery and stressed all possible moments in which the error may occur during surgery^{32,33}. Circumstances related to human and organizational factors are often decisive^{30,31,34} beyond the technical act itself, such as: stress, fatigue, distraction. All these conditions are set off when the operators must share shoulder to shoulder of a small working space. In the light of these considerations and in order to reduce the risk of errors, the protection of a sphere of free space for the surgeon, as well as subjectively experienced, is in our opinion a great advantage.

In our experience, the results in terms of laparotomic conversion, operative time, hospital stay, were similar in the two groups and in line with the literature data. The conversion must not be considered a complication, but a completion of surgical procedures, safe both for the patient and for the surgeon^{35,36}. Their incidence in the literature has a range of 1.5 - 19% and this is attributed to the comparison of cases that are not homogeneous and different risk factors^{35,37-44}. The low rates

observed in both groups of our study (2.8% and 1.4% respectively in the group a and b) can be attributed to the fact that all operators are experts in videolaparoscopy and had passed the phase of "learning curve" since some years. Morbidity rates obtained both with French technique than with the "American modified", fall within the ranges reported in the literature (1.5-17%)⁴⁵. The loss of bile, observed in 2.8% and 1.4% respectively in group a and b, usually occurs by the hepatic bed or from the cystic duct stump (less frequently from accessory ducts), and is among the most common complications of LSC (0.2% to 4%)⁴⁶⁻⁵⁴. It is not counted among the major biliary complications and it can be successfully treated by CPRE in many occasions⁵⁴. Finally, among several kind of classifications of surgical complications^{55,56}, we followed that one proposed by Clavien-Dindo and the morbidity observed in the two groups are fully in line with the literature.

Conclusions

While considering that the technique of LC (both French and America) has been well standardized since several years and that the researchers' main interests concern the achievement of an ever less invasivity (NOTES, SILS, robotics, minilaparoscopy), we decided to report our modification for the following considerations:

- The innovative techniques are certainly suggestive, but still with such objective limits that they can not, at the time, supplant the technique of LSC, which is still the reference technique.
- The LSC for years will represent the first "step" in the training of minimally invasive surgery.
- Our change retains the basic principles of the French and American and can be considered a compromise between the two.
- Our results in terms of conversion laparotomy, operative time, hospital stay, complications and mortality are similar to those reported for French and American techniques.

In conclusion our modification has proved feasible, safe and repeatable and it assures congruous working spaces and more comfortable movements to the surgeons.

Riassunto

INTRODUZIONE: La colecistectomia laparoscopica (CL) è una tecnica ben standardizzata da più di vent'anni. Due sono i principali approcci, uno proposto dalla Scuola francese, l'altro adottato dalla Scuola americana. Essi prevedono tempi operatori simili, ma una diversa disposizione dei trocar e differente posizionamento sia del paziente che dei chirurghi al tavolo operatorio. Sebbene si intravedano nuovi scenari per il prossimo futuro (robotica, SILS, NOTES, minilaparoscopia), ci è sembrato uti-

le descrivere una variante nel posizionamento degli operatori e del paziente rispetto alle tecniche standard, che abbiamo apportato nella nostra esperienza chirurgica negli ultimi anni.

MATERIALI E METODI: In un'analisi retrospettiva di 140 pazienti operati di CL negli ultimi due anni (70 con tecnica francese e 70 con tecnica "americana modificata") sono state confrontati i seguenti parametri: conversione laparotomica, durata dell'intervento, degenza post-operatoria, complicanze e mortalità.

RISULTATI: Conversione laparotomica, durata dell'intervento, e tempo di degenza sono risultati sovrapponibili. Anche le percentuali di complicanze non hanno presentato differenze statisticamente significative nei due gruppi. Non sono state registrate complicanze maggiori a carico dei vasi e delle vie biliari. La mortalità è stata nulla.

CONSIDERAZIONI. La nostra modifica sembra rappresentare quasi un compromesso tra la tecnica francese ed americana. Con la disposizione dei trocar e dell'equipe da noi adottata abbiamo riscontrato un maggior comfort per gli operatori durante l'intervento e sono stati ottenuti risultati del tutto sovrapponibili a quelli riportati per le tecniche tradizionali.

Queste considerazioni ci portano a ritenere la variante tecnica da noi adottata sicura ed affidabile.

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