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Ana Isabel Pereira de Magalhães
The most important emergency laparoscopies in gynecology:
A systematic literature review

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Assinatura conforme cartão de identificação:

Ana Isabel Pereira de Magalhães

NOME

Ana Isabel Pereira de Magalhães

CARTÃO DE CIDADÃO OU PASSAPORTE (se estrangeiro)

E-MAIL

TELEFONE OU TELEMÓVEL

13744690

anamagalhaes90@hotmail.com

967487663

NÚMERO DE ESTUDANTE

DATA DE CONCLUSÃO

200807753

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The most important emergency laparoscopies in gynecology: A systematic literature review

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Ana Isabel Pereira de Magalhães

Title:

The most important Emergency Laparoscopies in Gynecology: A systematic literature review

Authors:

Ana, I., DE MAGALHÃES, MD, Porto, Portugal, Faculdade de Medicina da Universidade do Porto, Alameda Professor Hernâni Monteiro, 4200-319 Porto.

João, L., SILVA-CARVALHO, MD, PhD, Porto, Portugal, Serviço de Obstetrícia/Ginecologia Hospital CUF Porto, Estrada da Circunvalação, 14341 4100-180 Porto; Faculdade de Medicina da Universidade do Porto, Alameda Professor Hernâni Monteiro, 4200-319 Porto.

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Corresponding Author:

João Luís Silva Carvalho, MD, PhD
Avenida Montevideu, 538 2º Esq., 4150-516 Porto
Tel: 226076530
Fax: 226076533
Email: jlsilvacarvalho@gmail.com

Condensation: Important indications of emergency laparoscopies in gynecology, including the management of adnexal torsion, inflammatory pelvic disease, tuboovarian abscess and ectopic pregnancy.

Short version of the title: Important emergency laparoscopies in gynecology.

Abstract:

Objective: To review the current evidence for the use of laparoscopy, both diagnostic and therapeutic, in the most frequent gynecological emergencies related to acute pelvic pain.

Study Design: A review of the literature was made in PubMed and PMC. All pertinent articles including randomized controlled trials, retrospective studies, case series, case reports, and reviews were identified after reviewed. Preference was given to articles published after 2000. After initial evaluation, 98 articles were determined to be relevant.

Results: There is no reliable method enabling the diagnosis of adnexal torsion pre-operatively. Laparoscopy has been important reducing the uncertainty of the diagnosis. Laparoscopic approach including untwisting of the adnexa, cystectomy and oophoropexy has been the standard of care.

In pelvic inflammatory disease, laparoscopic exploration has an important role whenever the diagnosis is unclear and the symptomatology unremitting. It allows an accurate diagnosis and several effective treatment options.

The role of laparoscopy in the diagnosis of ectopic pregnancy has been limited to cases where diagnostic stills in doubt after human chorionic gonadotropin measurements and ultrasonography findings. Nowadays, laparoscopy is the accepted approach to perform both salpingostomy and salpingectomy.

Conclusion: Early diagnostic laparoscopy in the emergency setting improves diagnostic rates, however should not replace a first-line investigation. Therapeutic laparoscopy procedures in gynecology emergencies are now universal practice. Well-structured laparoscopy training program on the entire spectrum of gynecologic emergencies is needed.

Key- Words: *Emergency Laparoscopies in Gynecology, Adnexal torsion, Pelvic inflammatory disease, Tuboovarian abscess, Ectopic pregnancy.*

Introduction:

Acute pelvic pain is variably defined as pain in the lower abdomen or pelvis presenting within six hours to eight days after onset ¹. It is a common complaint among young women, accounting for up to 40% of visits to gynecologic emergency departments ². Diagnosis of emergent gynecological conditions is challenging. They often present with varying symptoms and signs, potentially mimicking non-gynecologic causes like gastrointestinal and urogenital conditions ¹. In women at reproductive age, we must also consider pregnancy-related causes.

Some of the main gynecological emergencies include adnexal torsion, acute pelvic inflammatory disease, tuboovarian abscess and ectopic pregnancy. All of them are fertility- and life-threatening conditions, so a prompt diagnosis and emergent surgical treatment should be provided.

Historically, the use of laparoscopic techniques was restricted to diagnostic fields. Laparotomy was the standard of care for most gynecological emergencies ³⁻⁸. However, since the first reports of laparoscopy as a treatment tool in the late 1980s, its popularity has grown fast and widespread ⁹⁻¹⁸. Nowadays, this approach enables the solving of preoperative diagnostic doubts as well as the treatment of underlying diseases ^{19,20}. This review critically evaluates the current evidence for the use of laparoscopy, both diagnostic and therapeutic, in the most frequent gynecological emergencies related to acute pelvic pain. We aim to establish the preferred diagnostic procedures and define the optimal practice for each one.

Objective: To review the current evidence for the use of laparoscopy, both diagnostic and therapeutic, in the most frequent gynecological emergencies related to acute pelvic pain.

Methods:

A systematic review based on a comprehensive literature research was made on PubMed and PMC. Articles cited were identified using the keywords “emergency”, “laparoscopy”, “gynecology”, “adnexal torsion”, “inflammatory pelvic disease”, “tuboovarian abscess” and “ectopic pregnancy” in different combinations. All pertinent articles including randomized controlled trials, retrospective studies, case series, case reports, and reviews were identified after reviewed. We reviewed all English language articles with full text or abstract available. Preference was given to articles published after 2000. After initial evaluation, 98 articles were determined to be relevant to emergency laparoscopy indications in gynecology.

Results:**1- Adnexal Torsion:****What is adnexal torsion?**

The adnexa of the uterus, formed by the ovaries and fallopian tube, are prone to torsion. Ovary and/or fallopian tube torsion^{21,22}, happens when the adnexa suffer a complete or partial rotation on its ligamentous support, resulting in compromise of their blood supply and in sudden onset of pelvic pain. Adnexal torsion can be unilateral or bilateral, with the last one being extremely rare^{23,24}. It is the fifth most common gynecological emergency²⁵, with a reported incidence ranging from 2.7% to 3.0%²⁵⁻²⁷. Adnexal torsion can affect women of all ages²⁸⁻³¹ but it is more frequent among women of reproductive age²⁶. Most of this women desire future fertility, thus an accurate diagnosis and prompt treatment are important in an attempt to preserve ovarian function³².

What factors can predispose to adnexal torsion?

The major risk factors for adnexal torsion are: an ovarian mass (physiologic cyst or neoplasm)³³⁻³⁶; pregnancy and ovarian stimulation^{33,34,37-42}; previous pelvic surgery, particularly tubal ligation³⁵; past history of ovarian torsion^{43,44}; hypermobile adnexa³⁴; and an excessive length of the utero-ovarian ligament, particularly in the pediatric population⁴⁵.

What are the best diagnosing tools for adnexal torsion?

Adnexal torsion remains as one of the most challenging conditions to diagnose pre-operatively²⁷. Traditionally, diagnosis has stood on the clinical and sonography findings⁴⁶. Numerous retrospective analyses were undertaken to evaluate the clinical profile of adnexal torsion. Abdominal pain was the most common symptom (77.8- 98%), followed by nausea and vomiting (46-80.5%), mass in clinical examination (22.2- 72%), elevated white blood count (22.1- 75%), lower urinary tract symptoms (14.5%), fever (5.6- 7.8%) and abnormal genital tract bleeding (4%)^{25,27,47}. A gynecological ultrasound is usually the first imaging tool used in the approach of pelvic pain⁴³. The sonography findings that may be found in adnexal torsion are: ovarian enlargement, visualization of a cyst, solid or complex mass at the location of the adnexa, abnormal ovarian position in the pouch of Douglas, thickening of the adnexal wall, peripherally enlarged follicles, cystic hemorrhage and free pelvic fluid²⁷. Liang-Ming Lo and Col. reported that an adnexal or pelvic mass could be detected using gynecological ultrasound in almost all of the patients (98.3%)²⁵. Oltmann S.C and Col. stated that the finding most consistent with torsion on transvaginal ultrasound (TVU) was simply the presence of an enlarged ovary or adnexal mass, and confirmed that the sole presence of a mass larger than 5 cm had the best sensitivity for torsion (83%)³⁶.

Colour doppler ultrasound detects the ovarian blood flow, while spectral doppler can enable the differentiation between venous and arterial flow in the ovary. These techniques have been suggested as an additional tool to improve the accuracy of diagnosing ovarian torsion⁴³. The absence of venous, or arterial and venous, flow in an enlarged or cystic ovary on colour and spectral doppler studies, is highly predictive of ovarian torsion⁴⁸. Studies reported that, although highly specific, doppler sonography was not sufficiently sensitive. A normal flow by doppler sonography does not rule out ovarian torsion and should not delay surgical exploration if the patient presents with suggestive signs and symptoms^{34,46,47}.

Computerized tomography scan (CT scan) and magnetic resonance image (MRI) can detect ovarian torsion but they are not necessary in most cases, and should not delay treatment^{25,35,49}. Moreover, CT scan is contraindicated in pregnant women⁴⁷. Tumor markers, such as beta human chorionic gonadotropin (β -HCG), alpha-fetoprotein (α -FP), cancer antigen 125 (CA-125), lactate dehydrogenase (LDH) are not routinely screened in an emergency setting⁴⁵.

What is the importance of diagnostic laparoscopy in adnexal torsion?

At the present time, there is no reliable method enabling the diagnosis of adnexal torsion to be confirmed pre-operatively⁴⁹. Studies still report a poor correlation between preoperative diagnosis and surgery findings: Bar-On S and Col. found that women who underwent laparoscopy for suspected ovarian torsion were correctly diagnosed in only 46.1% of cases⁵⁰; Cohen SB and Col. stated that among 100 emergency laparoscopies, performed due to acute abdomen, ovarian torsion was the most difficult to diagnose preoperatively, with only 44% of cases being confirmed by laparoscopy⁵¹; Houry D.

reported that, among women with ovarian torsion, the diagnosis was initially considered in 47% of patients³⁵ while White M. found that it was considered in only 19% patients⁴³.

Thus, diagnostic laparoscopy can reduce the uncertainty of diagnosis in ovarian torsion.

Also, it offers a lot of other advantages: enables a rapid and accurate assessment²⁰, reduces the incidence of negative laparotomies, reduces morbidity and mortality from the underlying disease⁵² and, most of all, enables treatment.

What is the treatment?

What is the role of laparoscopy in the treatment of adnexal torsion?

Surgical approach by laparoscopy is the standard of care for adnexal torsion; it allows the physician to diagnose adnexal torsion in a first step, and to treat it in a second step^{25,26,32,35,36,43,45,49,53-55}. Multiple studies have confirmed the safety and efficacy of the laparoscopic approach for adnexal torsion in children^{28-30,36,45} and pregnant patients³⁷⁻⁴².

Results of Liang- Ming Lo and Col. show that patients undergoing laparoscopy had a smaller ovarian mass, a shorter hospital stay, and fewer of them suffered from postoperative fever, comparing to patients undergoing laparotomy²⁵. Oltmann SC and Col. also reported that a preoperative imaging mass size of less than 5cm was associated with use of a laparoscopic approach. They also found that laparoscopy rates increased from 18% in the 1993-2000 to 42% in the 2001-2008 period, reflecting the change over time in surgical practice³⁶. Laparoscopy approach has demonstrated to be superior to laparotomy as it results in lower rate of febrile morbidity, reduces consumption of analgesic drugs and shortens hospital stay^{32,55}.

Should laparoscopic treatment be conservative or radical?

Intraoperative management of adnexal torsion has been largely debated. In the past, treatment consisted of radical surgery. An ipsilateral oophorectomy by laparotomy was the standard of care, due to both concerns regarding thromboembolic phenomena and “black-bluish” appearance of twisted adnexa³². Nowadays, treatment is rather conservative. It is initiated by untwisting the adnexa, even when it appears necrotic, and completed, as required, by treatment of any cyst present and/or oophoropexy. All these steps are easily accomplished by laparoscopy⁴⁹.

Cohen SB. and Oelsner G. reported that, among 102 women who underwent surgery for ovarian torsion, detorsion of twisted “black-bluish” ischemic adnexa was easily accomplish by operative laparoscopy. They suggested that even gangrenous appearing adnexa should not be removed because it was difficult to estimate their viability during the procedure. They reported that the adnexa retrieved its functional integrity, shown by: ultrasonographic observation of follicular development (93.3%), the normal macroscopic appearance of the adnexa during subsequent surgical intervention (92.8%), and successful oocyte fertilization in all reported cases. They also recommended that detorsion alone should be performed, and cystectomy should be regarded as a later elective procedure^{32,55}.

Spinelli C. and Col. performed adnexal conservative surgery in 46.7% (laparoscopic in 40 % of cases) of children and adolescents, including 4 ovaries with a “black-bluish” macroscopic appearance. They observed a recovery of the ovarian tissue, with ovarian volume normalization by ultrasonography, within 3 to 6 months of follow-up. They also found that conservative treatment for twisted ovaries increased from 28% to 45% in the last 20 years, reflecting a great interest in conservative surgery⁴⁵.

Taskin O. and Col. reported that a possible explanation for the viability of ovarian tissue after 18-24h of ischaemia, based upon experimental animal data, is that total arterial occlusion may not be present in

the torsed ovary despite venous and lymphatic congestion⁵⁶. No increase in the number of thromboembolic complications after untwisting is evident from the literature reviewed^{25,26,32,35,36,43,45,49,53-55}.

Can we prevent adnexal torsion recurrence by laparoscopy?

With increasing ovarian conservation comes the potential risk for recurrent adnexal torsion. The risk of recurrence is low when adnexal torsion results from adnexal masses and is treated by laparoscopic cystectomy, but is higher when torsion of normal appearing adnexa is treated conservatively. Moreover, women with a previous episode of torsion of normal adnexa are also at increased risk of torsion of the contralateral adnexa⁵⁷. Recurrent adnexal torsion in normal adnexa may be due to an elongated ovarian ligament, or loose infundibulo-pelvic ligament⁵⁸.

Oophoropexy by laparoscopy intends to prevent potential recurrences in adnexal torsion cases⁵⁹. Unilateral/bilateral oophoropexy is achieved by several techniques: fixing the ovary to the pelvic sidewall, the broad ligament, the sacrouterine ligaments, and the round ligament, shortening of the uteroovarian ligament and suturing the uteroovarian ligament to the back of the uterus⁴⁵. Choice of the oophoropexy should be individualized⁵⁹. Most authors consider that in cases of recurrent ipsilateral torsion, or an elongated ovarian ligament despite no previous recurrence, fixing only the involved ovary is sufficient. Nevertheless, it seems reasonable to perform a contralateral oophoropexy in women requiring oophorectomy, to encounter the risk of development of an asynchronous bilateral ovarian torsion^{57,59,60}. Tsafir Z. and Col. reported a 9.5% rate of retorsion after adnexal fixation, highlighting that fixation does not necessarily eliminate the risk of ovarian

retorsion⁵⁸. The real efficacy of adnexal fixation remains undetermined but has proven that can be managed safely by laparoscopy.

2- Pelvic Inflammatory Disease (PID):

What is Pelvic Inflammatory Disease?

Pelvic Inflammatory Disease refers to the acute infection of the upper genital tract in women. It includes any combination of cervicitis, endometritis, salpingitis, tuboovarian abscess and pelvic peritonitis^{61,62}. Originally, PID was associated to *Neisseria gonorrhoeae* and *Chlamydia trachomatis* infection. Nowadays, it is recognized that these microorganisms cause only two-thirds of cases. *Gardenerella vaginalis*, *Mycoplasma genitalium/hominis*, *Ureaplasma spp.*, *Diphtheroids*, *Prevotella*, *Bacteroides*, other anaerobes and streptococci may also be involved^{62,63}. It is the most common infectious disease affecting young women, accounting for 94% of sexually transmitted disease associated morbidity in well-resourced countries⁴⁸.

This condition can cause significant reproductive health sequelae, including tuboovarian abscesses, pelvic adhesions, recurrent PID, chronic pelvic pain, infertility due to obstruction of fallopian tubes, and ectopic pregnancy in an increased factor of 7-10^{64,65}. Such complications are related to disease severity and timing of diagnosis. Prompt investigation is essential in order to attenuate disease impact⁶⁶.

What are the best diagnosing tools for PID?

The accuracy of different signs and symptoms in predicting the presence of PID has been extensively evaluated using laparoscopy as the gold standard⁶⁷⁻⁶⁹. Currently, the clinical diagnosis of PID is based on recommendations from the Center for Disease Control

and Prevention (CDC). Minimum diagnostic criteria (presence of cervical motion, uterine and adnexal tenderness) have been set with a high sensitivity and low specificity, in order to detect as many cases of clinical disease as possible. If all these criteria are present in sexually active young women, empiric treatment should be instituted. The CDC also provides a list of additional criteria that may help to improve diagnostic specificity: elevated oral temperature ($>38.3^{\circ}\text{C}$), abnormal cervical or vaginal discharge, elevated erythrocyte sedimentation rate, elevated C-reactive protein concentration, and laboratory documentation of cervical infection with *Neisseria gonorrhoeae* or *Chlamydia trachomatis* ⁶². Peipert JF and Col. showed that the clinical finding of adnexal tenderness had a sensitivity of 95.5%, which was superior to that of the CDC's minimal clinical criteria (83%) ⁷⁰.

There is not a pathognomonic laboratory test for upper genital tract infection. Combinations of positive tests can improve diagnostic specificity, but with a reduction of sensitivity ⁷¹. Ultrasound examination is able to detect thickening of fallopian tubal walls, tuboovarian abscesses and rule out other possible diagnoses like ovarian cysts and ovarian torsion ⁷². However, the sensitivity and specificity of ultrasound features is highly dependent of the severity of the disease ^{66,72}.

What is the importance of diagnostic laparoscopy in PID?

Laparoscopic exploration is warranted whenever the diagnosis is unclear and the symptomatology is unremitting, especially in young women for whom the preservation of fertility is important. Laparoscopic visualization of the triad of edema, hyperemia and a purulent exudate from the ends or surface of the fallopian tube has been considered the gold standard for PID diagnosis ^{61,66,70}. Laparoscopy can be used to directly visualize pelvic

anatomy and diagnose PID without aggravating the inflammatory process, and exclude other pathologies (which may be present in approximately 20% of patients)⁷³. However, its sensitivity varies depending on the stage of illness, being less sensitive in milder forms where diagnostic criteria are less objective⁶¹. In cases where there isn't a visual evidence of salpingitis by laparoscopy, endometrial biopsy is warranted because some women with PID can have endometritis alone. Gaitán and Col. reported that endometrial biopsy showed 75% of global accuracy, comparing with a global accuracy of 91% with laparoscopy. Laparoscopy showed an optimum specificity (100%), proving to be very useful in excluding other causes of abdominal pain in patients presenting with an atypical course⁶⁶.

Among these lines, in cases of abdominal pain of unknown cause where there is a suspicion of PID, laparoscopic surgery has become a diagnostic tool that permits, not only confirmation of the process but also: to take a microbiologic culture from the fallopian tubes to apply specific antibiotic therapy; a classification of the severity of the disease; the evaluation of the future fertility status of the patient; and therapeutic options, such as lysis of adhesions, aspiration of tuboovarian abscess and irrigation of the peritoneal cavity^{20,64,65}. In patients without PID, laparoscopy permits rapid recognition and treatment of differential pathologies like appendicitis, ovarian cyst, ovarian torsion and endometriosis, avoiding unnecessary antibiotic therapy⁶⁴. Costs, limited access, surgical risks, and the fact that not all institutions have the facilities or scheduling to submit all patients with acute abdominal pain to diagnostic laparoscopy, prevent the universal use of laparoscopy for the diagnosis of PID^{48,52}. However, the costs can be balanced by a shorter hospital stay and a reduction in unnecessary abdominal imaging⁵².

When should we think in therapeutic surgical laparoscopy in PID?

Tuboovarian abscess is not a disease entity, but rather a finding in the spectrum of PID. Treatment includes analgesia, fluids and intravenous broad-spectrum antibiotics. Although 60-80% will resolve without surgical intervention, it is prudent to identify those individuals who require immediate surgical intervention because delay can be fatal ⁴⁸. Currently, there are three situations where surgical intervention is recommended: a concern for an alternative surgical emergency, failure of clinical response after 48-72h of medical therapy or ruptured tuboovarian abscess with generalized peritonitis and septic shock. A review on the management options for tuboovarian abscess reported that laparoscopy should be considered in all patients with tuboovarian abscess who desire future conception. They reported pregnancy rates ranging from 32% to 63% in patients treated with medical therapy followed by immediate laparoscopy drainage within 24h, comparing to pregnancy rates ranging from 4% to 15% in patients treated with medical management alone; both without suspected rupture. They also report the major advantages of an immediate laparoscopy: it allows an accurate diagnosis and effective treatment under magnification with minimal complications; shows faster response rates with shorter hospitalization times and decreased infertility ⁷⁴. Surgical procedures can include laparoscopy with drainage of purulent fluid, adhesion lysis, tubal lavage, dissection and excision of necrotic tissue and thorough irrigation of the peritoneal cavity before completion of the procedure ^{19,73}. A particularly simple, safe and efficacious alternative approach is the use of ultrasound guided transvaginal drainage of the abscess in combination with antibiotics. Moreover, it can be difficult to reach a deep abscess in the pelvis through the laparoscope in the presence of extensive intestinal adhesions ^{73,75}.

3-Ectopic Pregnancy:

What is ectopic pregnancy?

Ectopic pregnancy occurs when the embryo fails to implant within the uterine cavity^{76,77}. The majority of ectopic pregnancies (95%) are located in the fallopian tube⁷⁸. The rising incidence of ectopic pregnancy in the past 30 years has been attributed to a number of factors including: a greater prevalence of sexually transmitted disease (PID), tubal sterilization and reversal, delayed childbearing, assisted reproductive technologies, and more successful clinical detection⁷⁹. Ectopic pregnancy is the leading cause of maternal mortality during the first trimester of pregnancy^{76,78,80,81}. Although spontaneous resolution of ectopic pregnancy can occur, patients are at risk of tubal rupture and catastrophic hemorrhage⁷⁸. Most fatal cases result from delayed diagnosis and inappropriate management. However, recent improvements made in diagnostic techniques have led to a marked reduction in mortality rates^{81,82}.

How to diagnose ectopic pregnancy?

Is there still a place for diagnostic laparoscopy?

In women of early pregnancy/history of amenorrhea presenting with acute pelvic pain and/or vaginal bleeding, a diagnosis of ectopic pregnancy should always be considered⁷³. On physical examination, an adnexal mass may be palpated. The diagnosis of ectopic pregnancy has evolved since the 1980s. Advanced ultrasonography techniques as well as improved β -HCG measurements have largely replaced laparoscopy as primary diagnostic tools. These tests allow us to detect an early ectopic pregnancy before clinical symptoms have the chance to set in^{3,19,82}. These days, the role of laparoscopy is limited to cases in which the diagnosis is still in doubt. In such cases, a choice must be made between expectant observation and laparoscopic confirmation¹⁹.

How to manage an ectopic pregnancy?

To date, the management options of tubal ectopic pregnancy are three-fold: expectant management, medical treatment or surgery. These three options have been compared in terms of efficacy, financial costs and future fertility^{73,76,77,79,83-85}. The criteria for choosing between therapeutic modalities in ectopic pregnancy remain unsettled. Expectant management has been advocated based on the knowledge that an early ectopic pregnancy can be self-limiting, resulting in tubal abortion or re-absorption⁷⁷. It has been advised in a selective group of patients asymptomatic with serum β -HCG cutoff level relatively low and declining⁷⁸. Medical treatment with methotrexate has been widely used in patients with minimal symptoms, who are hemodynamically stable, have no more than a moderate amount of intra-abdominal free-fluid on TVU scan and have β -HCG concentrations <3000 IU/l⁸³. The major contra-indications for medical management are: β -HCG level greater than 15,000 IU/L, fetal cardiac activity, and free fluid in the cul-de-sac on TVU. Surgical management is indicated if the patient is not eligible for medical therapy, if medical therapy has failed or if there are symptoms and signs of tubal rupture⁸³.

What is the role of laparoscopy in the surgical treatment of ectopic pregnancy?

Ectopic pregnancy represents a hallmark in the history of laparoscopic surgery: it was one of the first surgical pathology being treated through a laparoscope⁸⁶. Manhès, who first described the laparoscopic treatment of ectopic pregnancy, was the inventor of the Triton, the first laparoscopic multi-function instrument. Nowadays, laparoscopy is the accepted approach to perform both a salpingostomy and salpingectomy⁸⁷. Mol F. and Col. reported that although laparoscopic approach was significantly less successful than the

open surgical approach in eliminating of trophoblastic tissue, it was significantly less costly. The cost savings after laparoscopic surgery resulted from a significantly shorter operation time, less perioperative blood loss, shorter duration of hospital stay, and shorter convalescence time. Laparoscopy was the most cost-effective treatment in women with tubal ectopic pregnancy. The fertility outcome was comparable to laparotomy⁷⁷.

Laparoscopy also results in less postoperative adhesions formation and impairment of the pelvic status than laparotomy⁷⁹.

Should laparoscopic treatment be conservative or radical?

There is a controversy on whether to perform a conservative treatment (salpingostomy) or a radical treatment (salpingectomy) in ectopic pregnancy. The possible advantage of radical approach would be to eliminate the possibility of recurrence, but with lower rates of fertility (66%). In conservative approach rates of 8% of persistent ectopic pregnancy have been reported, but with higher rates of fertility (89%). So the conservative approach should be preferred whenever future fertility is required^{78,81}. Most authors agree that salpingectomy should only be performed in women with uncontrolled bleeding, recurrent ectopic pregnancy in the same tube, a severely damaged tube or a tubal gestational sac greater than 5cm in diameter⁷⁸.

Are there any indications remaining for laparotomy in ectopic pregnancy?

Laparoscopic surgery is the gold standard for the treatment of ectopic pregnancy in hemodynamically stable women. However, it is estimated that approximately 15% of women with ectopic pregnancy experience hypovolemic shock. In these cases, both the volume of haemoperitoneum and the hemodynamic status of the patient have been critical

factors in deciding whether to perform a laparoscopy or a laparotomy⁸⁸. Although historically contraindicated, numerous case reports and studies have proven that laparoscopy can be successful in cases of ruptured ectopic pregnancy with hemodynamic instability⁸⁸⁻⁹⁴. Laparoscopy has also been contraindicated in certain situations such as interstitial and cornual pregnancy and severe adhesions. The improvement of surgeons' skills and instrumentation has made these contraindications obsolete. Laparoscopy efficacy has been reported in interstitial and cornual pregnancies in various case reports^{90,95-98}. Thus, laparoscopy leaves little space for laparotomy in ectopic pregnancy management.

Comments:

Anteby S.O and Col. highlighted the value of laparoscopy in evaluation of acute pelvic pain in 1974. Since then, great advances in anesthesia care and cardiovascular monitoring, together with the development of a great number of devices and different techniques, have made possible the use of diagnostic and therapeutic laparoscopy procedures for gynecologic emergencies.

Nowadays, early diagnostic laparoscopy in the emergency setting improves diagnostic rates and reduces hospital stays and costs, when compared to other diagnostic modalities. Still, laparoscopy is an invasive technique and it should only be used after a first-line investigation combining clinical and sonography examination. Therapeutic laparoscopy procedures in gynecology emergencies are now universal practice. The efficacy and safety are comparable to laparotomy procedures but with several additional advantages: shorter operation times; impairment of pelvic status with less postoperative adhesions; few postoperative pain, fever and blood loss; reduction on consumption of analgesic drugs; fast recovery rates; shorter hospital stays; better cosmetics outcomes, and

lower costs. However, the safest approach should always be the one that the surgeon feels more comfortable with, and this should always be a factor regarding the type of intervention. The paradigm for training in surgery has always been the apprentice tutor model in which trainee firsts observes, then assists and finally operates; procedures with increasing complexity are performed; and the presence of the tutor is permanently required. This classical apprentice tutor model is insufficient for training in laparoscopic surgery since laparoscopy requires specific skills, different from those required in open surgery. Effective acquisition of laparoscopic psychomotor skills including depth appreciation from 2D screen using subtle visual clues, remote handling of instruments without tactile feedback, hand-eye coordination, and fine motor skills, is essential. So a well-structured training program on the entire spectrum of gynecologic emergencies is needed to improve laparoscopic surgical skills, in order to obtain optimum patient outcomes and to prevent an unacceptable amount of serious complications.

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