

Transluminal Surgery, A new Technique in Endoscopic Surgery

Presented by
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NCSS, version 2008



Change is a part of surgery and change is never easy to accept. At the dawn of surgery, excellence was associated with big incisions, hence the dictum:
big surgeon – big incision.
In 1987, Philippe Mouret performed the first laparoscopic cholecystectomy. The Anglo-Saxon world called it the "second French revolution". Minimally invasive surgery was born representing one of the greatest surgical evolutions of the 20th century.
Since its inception in 2004 geared up by A. Kallou, MD, the idea of endoluminal surgery has been proposed and documented.

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Major innovations in the neo era

The incisionless, (scarless) surgery

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The invisible cholecystectomy (transumbilical laparoscopic operation without a scar)

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Abstracts of the 1st World Congress of Laparoscopic Surgery

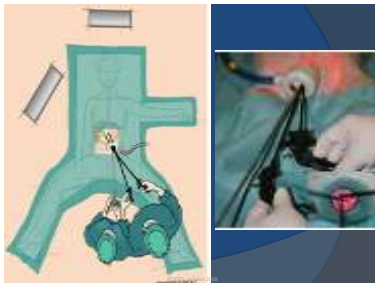
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TRIPORT

ABC Differs - The Future of Laparoscopic Surgery in Tunisia

The ABC TriPort is a multi instrument access port for laparoscopic surgery. Type of Instruments: Endoscopic. The ABC TriPort allows up to 3 instruments to be used simultaneously through a single incision thus making single port laparoscopic surgery a reality. For more laparoscopic procedures, the transumbilical cholecystectomy. The ABC TriPort is deployed within the umbilicus thus resulting the arrival of true scarless surgery.

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Single incision: The ability to insert up to 3 instruments through a single incision allows for a variety of laparoscopic procedures to be performed through a single incision. This is a significant advancement in minimally invasive surgery.

Endoscopic Access: The ABC TriPort is a multi instrument access port for laparoscopic surgery. It allows for the simultaneous use of up to 3 instruments through a single incision. This is a significant advancement in minimally invasive surgery.

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Background: Looking to further reduce the operative trauma of laparoscopic cholecystectomy, we introduced, in patients with no history of cholelithiasis and a normal BSA, a scarless operation through the umbilicus. The operative technique, along with the results of the first 10 patients operated in this way, are fully described below. To better quantify outcomes, we conducted a retrospective analysis of laparoscopic cholecystectomy. Through the umbilicus, two incisions of 5 mm were introduced parallel to another, with a bridge of tissue between them for the 2.5 mm laparoscope and the other for the grasper. With the help of one 1.0 cm incision, the gallbladder was introduced in the abdominal field and held with a bipolar dissecting device. The gallbladder was pinned up and the majority of gall stones dissected free. Results: 10 female patients, mean age 36 years (range 21-65), mean body mass index (BMI) 21 (range 17-26), after one office visit and a second office visit, patients were discharged unharmed by ultrasonography with no evidence of cholelithiasis, and included in this preliminary study. Mean operative time was 70 minutes (range 50-90) with no complications. Hospital stay was less than 24 hours with no complications. Conclusion: Looking to reduce operative trauma and improve the cosmetic result following laparoscopic cholecystectomy, a scarless laparoscopic operation technique has been developed. Results of the operative procedure in a selected group of patients are encouraging with no signs of cholelithiasis on normal BSA. The technique can be developed as a natural port for performing various operative procedures with the help of the traction produced by the fracture plane.

What is NOTES?
Natural **O**rifice **T**ransluminal **E**ndoscopic **S**urgery:

- Intentional puncture of one of the viscera (e.g., stomach, rectum, vagina, urinary bladder)
- to access the abdominal cavity
- With an endoscope (flexible or stiff)
- To perform an intraabdominal operation

From: JP. Thorely, et al., J Gastrointest Surg, 2007 Dec 3

The "invisible" cholecystectomy. A transumbilical laparoscopic operation without a scar

Author: Castro, Angel
Received Date: 12 Dec 2007
Issue Date: 12 Dec 2007
Class: Laparoscopic Cholecystectomy

Abstract: Background: Looking to further reduce the operative trauma of laparoscopic cholecystectomy, we introduced, in patients with no history of cholelithiasis and a normal BSA, a scarless operation through the umbilicus. The operative technique, along with the results of the first 10 patients operated in this way, are fully described below. To better quantify outcomes, we conducted a retrospective analysis of laparoscopic cholecystectomy. Through the umbilicus, two incisions of 5 mm were introduced parallel to another, with a bridge of tissue between them for the 2.5 mm laparoscope and the other for the grasper. With the help of one 1.0 cm incision, the gallbladder was introduced in the abdominal field and held with a bipolar dissecting device. The gallbladder was pinned up and the majority of gall stones dissected free. Results: 10 female patients, mean age 36 years (range 21-65), mean body mass index (BMI) 21 (range 17-26), after one office visit and a second office visit, patients were discharged unharmed by ultrasonography with no evidence of cholelithiasis, and included in this preliminary study. Mean operative time was 70 minutes (range 50-90) with no complications. Hospital stay was less than 24 hours with no complications. Conclusion: Looking to reduce operative trauma and improve the cosmetic result following laparoscopic cholecystectomy, a scarless laparoscopic operation technique has been developed. Results of the operative procedure in a selected group of patients are encouraging with no signs of cholelithiasis on normal BSA. The technique can be developed as a natural port for performing various operative procedures with the help of the traction produced by the fracture plane.

Natural orifice transluminal endoscopic surgery (N.O.T.E.S.)

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From: JP. Thorely, et al., J Gastrointest Surg, 2007 Dec 3

*** Open Surgery** *** NOTES**

The field of flexible endoscopy has undergone a major paradigm shift from a simple diagnostic tool to an advanced interventional and surgical tool capable of sophisticated diagnosis, and surgical therapies of gastrointestinal as well as peritoneal and thoracic structures. NOTES is the extension of the flexible endoscope's capabilities to reach organs outside the lumen of the bowel for the purposes of diagnosis, and treatment including resective therapies, such as appendectomy, cholecystectomy, or splenectomy.

Apollo-Olympus projects (1997)

- *- Wide spread mucosectomy procedures.
- *- Endoscopic suturing skills, and instruments (e.g Eagle claw)
- *- Endoscopic treatment of GERD.
- *- Transgastric endoscopic surgery:
 - Transgastric peritoneoscopy (Kalloo & Kantsevov, 2000)
 - Transgastric gastrojejunostomy (Kalloo & Kantsevov, 2002)

From Kantsevov et al. GIE 2005; 62(2): 287 – 92





Suture Devices

Eagle Claw
Apollo Project
Olympus, Tokyo.

Initial concept of natural orifice surgery:

- *- Puncture of the stomach wall (e.g. diathermy needles).
- *- Balloon dilation of the puncture wound.
- *- Entrance of the peritoneal cavity by the scope.
- *- the surgical procedure proposed to be done .
- *- Gastric closure

New Minors & Major

Acute and survival models in pigs

Transgastric access
Peritoneal cavity exploration
Liver biopsy
Gastric closure

Flexible transgastric peritoneoscopy: a novel approach to diagnostic and therapeutic interventions in the peritoneal cavity

Kalloo AN, Gastrointest Endosc. 2004 Jul;60(1):114-7

NOTES: Further Research

- Tubal ligation
- Cholecystectomy
- Gastrojejunostomy
- Oophorectomy
- Tubectomy
- Splenectomy
- Nephrectomy
- Pancreatic resection

Transvaginal gastric bypass

Geneva, Switzerland 2007 - 2008

Advantages of NOTES

- *- Less invasive
- *- Avoidance of wound and its infections
- *- Less pain and the need for analgesics
- *- Decreased post-op. ileus, and improve recovery
- *- Perfect cosmetic results
- *- More rapid recovery
- *- Less adhesions
- *- No abdominal wall hernias
- *- Better approach for obese patients
- *- Increase patient acceptance of surgical procedures

NOTES promises to complete the evolutionary arc from open to laparoscopic to no-scar surgery. In the race to do so, however, it is important to ensure that we do not make the same mistakes which were observed at the dawn of the laparoscopic era with subsequent impact on its rapid uptake.

Another factor which further complicates the NOTES era is the fact that it will be practiced by both surgeons and gastroenterologists who have not had common channels of information, training and oversight. The creation of a common task force helps to provide guidelines for safe conduct and adoption of these new therapies.

NOTES
Transgastric surgical approach

NOSCAR

(Natural Orifice Surgery Consortium for Assessment and Research)

- Based on teams of expert laparoscopic surgeons and flexible endoscopists
- Consortium of teams committed for advancing NOTES
- Agree to report and publish experience with NOTES
- Agree to perform human trials only after institutional review board (IRB) approval (www.notesconsortium.org)

Current NOTES groups

- European NOTES group – EuroNOTES
- Japanese NOTES working group
- Asia pacific NOTES group
- South American NOTES group
- Canadian NOTES group

Although Transgastric access to the abdominal cavity seems to be the route that will dominate NOTES in the future, there are still some challenging issues, such as risk of infection or leakage and the method of gastric closure, that will need to be addressed before this technique is popularized. In contrast, Transvaginal access is well established and accepted. It has been used for years by gynecologists for diagnostic and therapeutic purposes (e.g. hysterectomy, myomectomy, adnexectomy, and fertiloscopy). In addition, surgeons have used this route to extract large specimens after laparoscopic procedures involving the gallbladder, colon, spleen, and kidney.

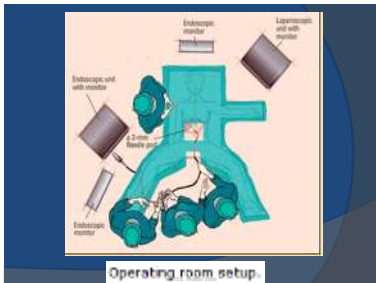
Transvaginal cholecystectomy is claimed to be pain-free, scar-free, and without bleeding. An initial procedure performed in France, and Published in the Archives of Surgery . The technical term is colpotomy (through the cervical vault). A flexible videogastroscope and standard endoscopy instruments were used, it took 3 hours. There was no postoperative pain, and the patient was sent home on the 2nd postoperative day; the NOTES enthusiasts are looking forward in offering 'invisible mending', although it will likely be more expensive than other approaches.

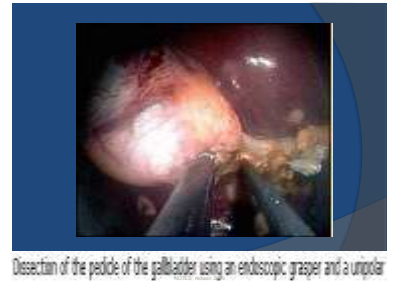
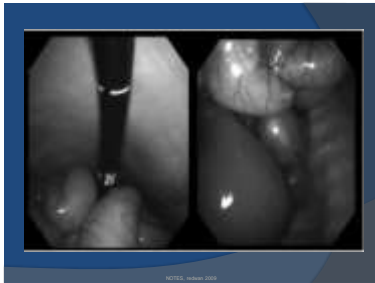
The world first, called **"operation Anubis"**, was presented at the Japanese Congress of Surgery in Osaka on April 6th and during the Congress of the Society of American Gastrointestinal Endoscopic Surgery (**SAGES**) last week-end in Las Vegas. Anubis was the ancient god in Egyptian mythology who restored Osiris to life through mummification using long, flexible instruments. The project was named after this reference.

An important step was made by the Columbia group in New York, United States on March 20th, 2007 when a hybrid **transvaginal cholecystectomy** was performed with the assistance of three laparoscopic trocars (New York Times, April 20th, 2007 - San Francisco Chronicle, April 20th, 2007 - SAGES Annual Meeting, Las Vegas, April 22nd, 2007). Operation Anubis performed without incision, save from using a 2mm needle allowing for insufflations and control of intra-abdominal pressure, represents an extremely important step towards totally non-invasive surgery. The next challenge will be to validate other approaches, the transgastric route being the most appealing.

The justification of this technique are: the reduction or absence of postoperative pain, ease of access to some organs, the absence of trauma to the abdominal wall, ideal cosmetic results and the psychological advantages of eliminating the bodily trauma represented by surgery. Lastly and as pointed out by P. Swain, this provides proof that there are no limits to how human ingenuity and technology can reduce the physical and emotional trauma related to the surgical act.

The successful performance of the operation at the University Hospital in Strasbourg, is the results of three years of research under the Anubis project, labelled by the **"Therapeutic Innovation Biocluster"**.





Intraoperative view of the gallbladder obtained with the flexible endoscope.

Dissection of the pedicle of the gallbladder using an endoscopic grasper and a unipolar



Since the editorial of July 2006, the field of NOTES has grown exponentially. The lesson learned from the advent of laparoscopic surgery is that we could now be witnessing the third surgical revolution. By nature surgeons are innovators and it seems that NOTES is here to stay. A growing number of teams developed new surgical procedures of increasing complexity. Without a doubt, the development of laparoscopic cholecystectomy was a phenomenon that changed the focus of surgery and the mindset of nearly all surgeons. For this reason the initial project focused on transgastric approach which seemed to be the most logical and appealing clinical application. The results obtained by NOTES opened the door to new, more complex procedures.

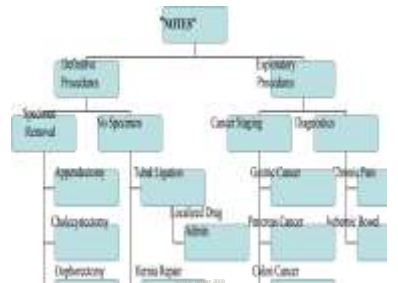
Division of the cystic duct and artery with endoscopic scissors.

Extraction of the gallbladder in a retrieval bag.

- ### Time line for NOTES
- Nov. 2006. Publish transgastric appendectomy
 - Feb. 2007. Publish transcolonic access
 - March 2007. Publish ventral hernia repair
 - May 2007. Publish 1st human NOTES – PEG rescue
 - May 2007. Human transvaginal cholecystectomy – hybrid (Brazil, New York, France)
 - June 2007. 1st human transgastric cholecystectomy - hybrid (Swanstrom)
 - March 2008. Transgastric appendectomy – hybrid (Horgan/ Talamini/Savides)
 - 2008. 1st Human transvaginal sleeve gastrectomy (Brazil)

NOTES procedures

Application	Approach
L. Adrenalectomy	TG
Cholecystectomy	TG,TV,TC
Tubal ligation/salpingectomy	TG
Diaphragm pacing	TG
Abd. Exploration in ICU	TG
PEG rescue	TG
Ventral hernia repair	TC,TG
Gastrojejunostomy	TG
Hysterectomy	TG
Splenectomy	TG
Peritoneal cancer staging	TG



Obstacles to NOTES

- > Surgeons lack skills in flexible endoscopy
- > Gastroenterologists lack surgical experience/ principles and access to OR
- > Access (peritoneal cavity)
- > Closure (gastric – colonic) – flexible stapler
- > Suturing – Eagle claw
- > Anastomosis
- > Spatial orientation
- > Multi-tasking platform – robotics
- > Management of intra-operative events
- > Physiological untoward events
- > Training

White paper – Gastrointest. Endosc. And Surg. Endosc. 2006
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Technical problems of NOTES

- Access to abdominal cavity
- Pneumoperitoneum
- Intra-peritoneal navigation
- Orientation
- Stable platform
- Tissue manipulation
- Specimen extraction
- Access site closure

The specialty NOTES is not a specialty yet
NOTES, volume 2008

Access: Endoscopic Trocar

- Endoscopic Veress Needle + Overtube Cannula
- Reduced instrument exchanges
- (Re)intubation pathway
- Insufflation and desufflation
- Supports scope shaft




Ethicon Endosurgery, USA

Closure: TAS

Tissue Apposition System

- T-tag applicator + knotting element
- 2.8 mm channel
- Closure of porcine colon perforation demonstrates equivalency to surgery with advantages for adhesion formation



Ethicon Endosurgery, USA

Development of platforms for NOTES I



USGI, USA

Development of platforms for NOTES II



USGI, USA Boston Scientific, USA

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Magnetic retraction, external hand magnet controlled dissection with hydraulically elevated cautery knife



D. Scott, USA

Operation Anubis: A New Step in NOTES History!

Ballestracci, MD, FACS, FRCS (France), Strasbourg, France
RCAD, ETS - Université Louis Pasteur, Strasbourg, France

On April 2nd 2007, at the University Hospital of Strasbourg, Professor Jacques Mascou and his team, B. Dallemagne, MD, S. Parvizi, MD, D. Mialot, MD, PhD, FACS, A. Hattala, MD, D. Calamandrei, MD, successfully performed the first no-staple, fully NOTES robotic colorectal operation using a flexible endoscope for transgastric cholecystectomy in a 50-year-old woman with symptomatic gallstones.

This world first, called "Operation Anubis" was presented at the Japanese Congress of Surgery in Osaka on April 6th and during the Congress of the Society of American Gastrointestinal Endoscopic Surgery (SAGES) the week-end in Las Vegas.

Anubis was the subject of a paper in European endoscopy who received Citec in life through multimedia using long flexible instruments. The project was named after the sphinx.

Change in part of surgery. The lesson learned from the advent of laparoscopic surgery is that we could now be witnessing the third surgical revolution. By nature surgeons are innovators and it seems that NOTES is here to stay, a growing number of teams developed new surgical procedures of increasing complexity. Without a doubt, the development of laparoscopic cholecystectomy was a phenomenon that changed the focus of surgery and the mindset of nearly all surgeons. For this reason the initial project focused on transgastric cholecystectomy which seemed to be the most logical and appealing clinical application. The results obtained in animal models outlined in the imminent human application of NOTES and opened the door to new, more complex procedures.

The interest in this new field was confirmed by a survey conducted among the 3000 surgeons who are trained every year at the RCAD-ETS. When asked whether they would like to be trained in NOTES, 80 per cent of surgeons said they were interested, anticipating that this emerging field will become a real and valid alternative to laparoscopy over the next four years.

The RCAD has been actively involved in the development of NOTES since 2004.

The achievements of the past two years place RCAD and Strasbourg among the world leaders in this field. This led to the organization of the first hands-on NOTES course, which will be taking place next May 4-5.

The course objective is to educate and train gastroenterologists and surgeons who wish to become familiar with flexible endoscopy and this new surgical domain.

This world-renowned faculty will have the exciting task to educate the NOTES neophytes.

To this end the European Society for Translational Surgery (EATS) was created in December 2006. The aim of the Society is to gather experts and teams to provide recommendations, support and guidance to this new surgical era.

NOTES, volume 2008

Dallemagne, B. Mascou J. NOTES, another step forward. Evaluation: WebSurg.com, Mar 2007 7(10). URL: <http://www.web-surg.com/0703072208>

NOTES: another step forward!

B Dallemagne, MD (France), J Mascoux, MD, FACS, FRCS (France)
RCAD / ETS - Université Louis Pasteur, Strasbourg, France

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Natural Orifice Transluminal Endoscopic Surgery (NOTES): The Dawn of a New Era
 M Arvan, MB BS, PhD, FRCS, FACS (Canada), J Manolagas, MD, FACS, FRCS (France)
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Natural Orifice Transluminal Endoscopic Surgery (NOTES) is the extension of the flexible endoscopy's capabilities to reach organs outside the lumen of the bowel for the purposes of diagnosis, and treatment including resective therapies, such as appendectomy, cholecystectomy, or salpingectomy.

While still in the experimental phase, NOTES promises to complete the evolutionary arc from open to laparoscopic to no-scar surgery facilitating improved patient recovery and reduced need for analgesics, post-operative and improved cosmetic results. Thus, the patient acceptance of such therapies is likely to be high and will likely drive the investment of time and effort and funds to quickly identify and deliver safe and effective NOTES procedures into the market. In the time to do so, however, it is important to ensure that we do not make the same mistakes which were observed at the dawn of the laparoscopic era with substantial impact on its rapid uptake.

A factor which further complicates the NOTES era is the fact that it will be practiced by both surgeons and gastroenterologists who have not had common channels of information, training and oversight. The creation of a common task force between ASGEES and ASGE is provide guidelines for safe conduct and adoption of these new therapies is a major step. Another is access to up-to-date educational material and information on new techniques being evaluated, and the latest results available. To this end, WebSurg has decided to dedicate a specific section on NOTES and other advanced endoscopic interventions. We will endeavor to bring to our readers the latest developments in the field of NOTES and provide training and educational material and videos to assist those interested in pursuing this field.

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