Open Appendectomy: The Gold Standard

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December 3, 2007
Outline

- History of appendectomy
- Comparison - OA vs. LA
  - Adults and children
  - Pregnancy
- Financial analysis
- Conclusion

“I’m afraid we’re going to have to remove your appendix.”
Appendicitis

- 6-8% lifetime risk of appendicitis
- 1/766 pregnant women are seen for presumed appendicitis
- 1/1500 pregnant women suffer from appendicitis
- Overall mortality 0.05%-0.3%
History of Appendectomy

- 1522 - Appendix described by Bereugarius Carpus
- 1894 - Dr. Charles McBurney performed open appendectomy (McBurney 1894)
- 1983 - First laparoscopic appendectomy performed by Dr. Kurt Semm (Semm 1983)
  - Dramatic rise in universal health care costs since 1983...coincidence?
Sages Appropriateness Conference

- **Level 1a evidence**
  - Longer operative times in LA
  - Infectious wound rate decreased in LA. Diminished when analyzed with ITT
  - 2-3 fold increase in deep abscess rate, most apparent in pediatric population

- **Level 2a and 3 evidence**
  - Safety and efficacy of laparoscopy in pregnancy

- **Obese patients (BMI >26) may be beneficial**

- **Controversial in pediatric population**

Laparoscopic versus open surgery for suspected appendicitis

(Review)

Sauerland S, Lefering R, Neugebauer EAM

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in The Cochrane Library 2006, Issue 4
• 54 studies analyzed
• 45 studies compared LA vs. OA in adults
• All randomized control trials
• 63% of studies analyzed as intention-to-treat (ITT)
• Only 5 trials blinded patient and/or investigator

Wound infections less likely in LA (CI 0.35-0.58)

Threefold increase in IAA increased after LA (CI 1.45-4.28)

Significantly higher operation costs in LA

OA offers shorter operative times for adults (CI 7-16) and children (CI 6-16)

Return to work was similar in LA and OA with a difference of 0 days (CI 2-2)

“Not a single study reported a significant increase in hospital stay”

Pain reported as slight decrease after LA in adults

9mm out of 100mm on visual analogue scale
Conclusions:

- Trend of longer operative times in adults and children
- Higher operative costs in LA
- Decreased IAA in OA, but slight increased in wound infection rate - significance of wound infection vs. IAA?
- Reduction of pain in LA – statistically significant, but not a clinically relevant outcomes
Review

Laparoscopic Versus Open Appendectomy in Children
A Meta-Analysis

Omer Aziz, MRCS, Thanos Athanasiou, MD, PhD, FETCS, Paris P. Tekkis, MD, FRCS, Sanjay Purkayastha, MRCS, James Haddow, MBBS, Vitali Malinovski, MBBS, Paraskevas Paraskeva, MD, FRCS, and Ara Darzi, FRCS, KBE

Annals of Surgery • Volume 243, Number 1, January 2006
Meta-analysis 1992-2004
- 23 studies analyzed (Retrospective, NR/RCT)
- 7 randomized trials (3 RCT with >50 patients/arm)
- Non-blinded studies

- 6477 children
  - 43% laparoscopic; 57% open

- Not matched for severity of appendicitis

- **Wound infection**
  - Meta-analysis: LA 1.5% vs. OA 5% CI .27-.75
  - RCT or PS: no statistical significance

- **IAA**
  - RCT: LA 7.4% vs. OA 4.2% CI 1.0-2.87

- **Postoperative ileus**
  - No individual trial showed a statistical difference
  - RCT: LA 1.3% vs. OA 4.8% NSS

- **Postoperative fever:** not statistically significant

Conclusions:

- Variation in study type, protocols, instruments, type of randomization and outcome assessment
- Few analyzed on ITT basis
- When analyzed through RCT, no statistical difference in complication rates
- LOS decreased in LA by 0.48 days. Statistically significant, but factor in pediatric population?
- Hospital costs decreased 18% for OA

Laparoscopic Versus Open Appendectomy
A Prospective Randomized Double-Blind Study

Namir Katkhouda, MD, Rodney J. Mason, MD, Shirin Towfigh, MD,
Anna Gevorgyan, MD, and Rahila Essani, MD
Prospective double-blind randomized study
- Patients randomized by computer
- 3 abdominal dressings and abdominal binder

247 patients
- 134 OA; 113 LA

Analyzed on intention to treat basis
- 8% conversion to OA

1 center, 4 surgeons and all cases were performed by residents

• Wound infection rate: LA 6.2% vs. OA 6.7% (p=1.00)

• Intraabdominal abscess: LA 5.3% vs. OA 3% (P=0.51)

• Operative time: LA 80 min vs. OA 60 min (p=0.00)

• No difference in activity of pain QOL scores

• Time to liquid/solid, LOS, pain, oral analgesics - NSS

Conclusions:

- Using ITT analysis and appropriate blinding LA fails to offer benefit over OA
- Similar complication rates
- Longer operative time means more anesthetic and higher OR costs
- No statistical variance in subjective or objective pain scores

Negative Appendectomy in Pregnant Women Is Associated with a Substantial Risk of Fetal Loss

Marcia L McGory, MD, David S Zingmond, MD, PhD, Areti Tillou, MD, Jonathan R Hiatt, MD, FACS, Clifford Y Ko, MD, MS, MSHS, FACS, Henry M Cryer, MD, PhD, FACS
• Retrospective Study 1995-2002
  • 3,133 pregnant appendectomies (3.3% of all appendectomies in women)
  • OA 2,375 vs. LA 454

• Negative appendectomy rate
  • Pregnant 23% vs. nonpregnant 18% (p<0.05)

• Complicated appendicitis
  • 30% pregnant women vs. 29% non-pregnant

Early delivery (same hospitalization)
- Complicated appy 11%; Negative appy 10%
- OA 8% vs LA 1%

Fetal loss
- 4% of all appendectomies
- OA 3% vs. LA 7% \((p<0.05)\) Odds Ratio OA 1.00; LA 2.31 (CI 1.51-3.55)
- Negative LA (27%) - 8% fetal loss
- Complicated LA - 13% fetal loss

Conclusions:

- Need for larger randomized control trials

- Higher early delivery rate in OA, but no outcome data and no post-hospital followup
  - Other studies have shown no difference (Affleck et al. Am J Surg 1999)

- LA has higher fetal loss rate...balance against diagnostic capabilities

Can we afford to do laparoscopic appendectomy in an academic hospital?

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Manuscript received April 12, 2005; revised manuscript August 8, 2005

Presented at the 57th Annual Meeting of the Southwestern Surgical Congress, San Antonio, Texas, April 10–12, 2005
• Retrospective study 2003-2004
  - 247 patients
  - 152 OA vs. 88 LA

• OR time (min) - LA 95.7 vs. OA 90.5 (p<0.05)

• Operating time (min) - LA 57.4 vs. OA 56.3 (p<0.05)

• LOS (days) - LA 2.2 vs. OA 2.6 (p<0.05)
Operating room charges

- Equipment charge: OA $125.32 vs. LA $1,078.70 (p<0.05)
- Operative time charge: OA $3,022.16 vs. LA $4065.24 (p<0.05)

Total Hospital Charges

- All appendectomies: OA $12,310 vs. LA $16,773 (p<0.05)
- Non-perforated: OA $9,632 vs. LA $14,251 (p<0.05)
- Perforated: OA $12,215 vs. LA $27,639 (p<0.05)
- Cost prohibitive to resident teaching in an academic institution? Is laparoscopy routinely worth the cost?

- $953/case difference in equipment charges alone between OA vs LA ($253,000 if all LA)

- Estimated $800,000 in hospital charges lost to laparoscopy during study

Conclusions: Open versus Laparoscopic

- Wound infection rate slightly lower in LA...NSS in double blinded RCT.
- IAA rate less in OA. Clinically relevant despite marginally not statistically significant.
- LOS smaller in LA by <1 day. Multiple studies show no statistical difference.
- LA claims small decrease in pain scale over OA. Double blinded RCT using SF-36 questionnaire shows NSS.
Conclusions: Open versus Laparoscopic

- Analysis in pregnant women...LA may offer diagnostic advantages, but at higher risk to fetus.

- LA in pediatrics showed no statistical difference in complication rates in RCT, but higher operative costs.

- Longer operative times and higher equipment costs when done laparoscopically.
References

- Rueda, C. Laparoscopic Appendectomy Overrated. UCHSC resident debate forum. 2006.