

PULMONARY FUNCTION IN LAPAROSCOPIC VS. OPEN COLON RESECTION

Pulmonary Function Following Laparoscopic or Conventional Colorectal Resection.

Schwenk et al. Arch Surg. 1999;134:6-12.

Background:

- Suppression of pulmonary function (PF) is a well known sequela of abdominal surgery since 1933.
- It is known that PFTs are reduced by 50 – 60% after surgery.
- This is due to dysfunction of the diaphragm, pain, CNS depressants, and muscular weakness.
- FRC decreases and leads to small airway collapse and atelectasis.
- PF takes greater than 1 week to recover to Pre-op values.
- Pneumonia is clinically apparent in ~5-7% of all patients undergoing conventional colorectal resections due to impaired pulmonary function.

Method:

- Hypothesis: PF is less suppressed and recovers faster following laparoscopic vs. conventional colorectal resection.
- Record PFTs
- Population: All patients diagnosed with colorectal tumors and scheduled for resection located in right, sigmoid, and rectosigmoid or APR.
- Exclusions: lower rectal CA <12cm. obstruction, abscess, sepsis, infiltrating tumor into adjacent organs, tumor > 8cm, severe obesity, operative risk > ASA > class III, uncorrectable coagulopathy.
- Operative technique: All patients underwent diagnostic laparoscopy, if resection feasible then intraoperative randomization was accomplished. If laparoscopy thought not to be possible then patient excluded.
- Pneumoperitoneum to 12 mmHg.
- Post-op morphine PCA

Results: 30 open vs. 30 laparoscopic

- 1 laparoscopy converted to laparoscopic assisted included in laparoscopy group
- 1 open case required re-exploration for bleeding
- Patient demographics not different
- None of the patients had PFTs below 70% expected
- OR TIME: Lap 219±64 min vs. Open 146±41 min (P<0.01)
- M&M: open- 1 major morbidity (bleed) and 8 minors including pneumonia X 2. 1 death
- LOS: 10.1±3 for leaving vs. 11.6±2 open (P<0.05)
- PFTs: more severely suppressed after conventional
- Therapy. 50-60% previous state vs 35% lap.
- Recovery to 80% pre-op level

Discussion:

- Overall 50% reduction of PFTs after all laparotomies with a 7d

- Reason for suppression of PFTs include paradoxical upward movement of diaphragm
- Several studies demonstrate 50% PFT suppression in open cholecystectomy and vs. 19-27% after laparoscopic cholecystectomy.
- 2 previous studies failed to demonstrate a difference.
- Long turnover time

Conclusions:

- This randomized control trial demonstrates PF 30-35% less suppressed and recovers to 40 – 45% faster after laparoscopic compared to open.
- PF is better after laparoscopic than open CR resections. Pulmonary complications may be reduced after laparoscopic resection because of better post-op pulmonary function tests.

Critique:

- Technique – lower incision, epidural
- Few patients with underlying pulmonary disease.
- No show of difference between mortality.

Table 3. Postoperative Morbidity and Death After Laparoscopic and Conventional Resection of Colorectal Tumors*

| Variable | Patient Group | | P† |
|--------------------------------------|---------------------------------|---------------------------------|------|
| | Laparoscopic Resection (n = 30) | Conventional Resection (n = 30) | |
| Major complications‡ | | | |
| Hemorrhage on day of primary surgery | 0 | 1 | >.99 |
| Intraperitoneal abscess§ | 0 | 1 | >.99 |
| Minor complications | | | |
| Pneumonia | 0 | 2 | .49 |
| Perineal wound healing impairment | 0 | 1 | >.99 |
| Symptomatic hyperglycemia | 0 | 1 | >.99 |
| Central venous (CV) line infection | 0 | 1 | >.99 |
| Brachial plexus lesion (CV line) | 0 | 1 | >.99 |
| Urinary tract infection | 2 | 0 | .49 |
| Surgical morbidity | 0 | 3 | .20 |
| Total morbidity | 2 | 8 | .08 |
| Death | | | |
| In hospital | 0 | 0 | >.99 |
| <30 d | 0 | 1 | >.99 |

*Data are the number of patients.

†Fisher exact test.

‡Requiring a laparotomy.

§On 17th postoperative day.

||Requiring medical treatment.

Table 4. Pulmonary Function at 2 PM on the First Day After Laparoscopic or Conventional Resection of Colorectal Tumors*

| Test | Patient Group | | P† |
|--------------------------------|---------------------------------|---------------------------------|------|
| | Laparoscopic Resection (n = 30) | Conventional Resection (n = 30) | |
| FVC, L | 2.59 ± 1.11 | 1.73 ± 0.60 | <.01 |
| FEV ₁ , L/s | 1.80 ± 0.80 | 1.19 ± 0.51 | <.01 |
| PEF, L/s | 3.60 ± 2.22 | 2.51 ± 1.37 | <.05 |
| FEV ₁ /FVC ratio, % | 69.6 ± 11.0 | 67.7 ± 9.8 | .51 |
| FEF _{25%-75%} , L/s | 2.67 ± 1.76 | 1.87 ± 1.12 | <.05 |
| SaO ₂ , % | 93.8 ± 1.9 | 92.1 ± 3.3 | <.05 |

*Data are given as mean ± SD of actual values and percentage of preoperative values. The abbreviations are the same as explained in the first footnote of Table 2.
†Student t test.

Comparison of Pulmonary Function and Postoperative Pain after Lap vs. Open Gastric Bypass: A Randomized Trial

Nguyen et al. J Am Coll Surg. 2001;192:469-476.

POD#1 lap 53% vs open 40% from pre-op PFTs

POD#7 lap 98% vs open 87%

Laparoscopic gastric bypass conferred less of impairment and faster recovery of pulmonary function.

Table I. Comparison of pulmonary function before and after laparoscopic and open cholecystectomy

| Study | Laparoscopic cholecystectomy | | | | Open cholecystectomy | | | |
|----------------------------|------------------------------|------------------|-------|----------------------|----------------------|------------------|-----|----------------------|
| | FVC | FEV ₁ | TLC | FEF ₂₅₋₇₅ | FVC | FEV ₁ | TLC | FEF ₂₅₋₇₅ |
| Frazee et al ⁷ | 73%* | 72%* | NM | 81% | 54% | 52% | NM | 53% |
| Schauer et al ⁵ | 79%*† | 76%*† | 92%*† | 68%*† | 49%† | 44%† | 78% | 34%† |
| Goodale et al ⁶ | 78%† | 80%† | NM | NM | NM | NM | NM | NM |

Values represent measurements taken on postoperative day one and are expressed as the percent of the preoperatively measured values. FVC, Forced vital capacity; FEV₁, forced expiratory volume; TLC, total lung capacity; FEF₂₅₋₇₅, forced expiratory flow; NM, not measured.

*P < .05 vs open.

†P < .05 vs preoperative value.

tion tests. However, a few of the studies have investigated intraoperative pulmonary mechanics. Common to many studies is the measurement of pulmonary compliance and airway pressures.

ing and early intervention should minimize or eliminate such problems.

In contrast to the detrimental intraoperative respiratory consequences of laparoscopy, the postop-

Jason Frischer, M.D.
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