

Laparoscopic Surgery: Strategies for Future Outcome Studies

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The concept of minimally invasive surgery, including laparoscopic procedures, represents a major breakthrough as one of the important components of multimodal rehabilitation (fast-track surgery) to improve postoperative outcome. It is well documented that minimally invasive surgery reduces wound size, surgical stress responses and organ dysfunctions, mostly as a result of decreased pain and inflammatory responses. These effects have during the last 10 years translated into major improvements in clinical outcome in certain operations where the alternative was a large incision i.e. surgery for gastro-oesophageal reflux, hiatal hernias, adrenalectomy, bariatric surgery, splenectomy, nephrectomy, etc., most of which can be performed as day cases or with the need of 1–2 days' hospitalisation. So what is the problem? Do we need more scientific, randomised studies before we have a more widespread implementation of laparoscopy? Do we need more research and improvement? The answer is complex and has not been solved, except in the aforementioned procedures where there is no need for randomised studies to show improvements in *early* postoperative outcome compared with conventional open surgery. However, in many other, more common procedures, the role of laparoscopy is still debatable despite initial positive results reported in several randomised trial and meta-analyses in hernia surgery, cholecystectomy, colonic surgery, hysterectomy, etc. On the positive side, these studies have repeatedly demonstrated some improvements with laparoscopy because of less pain, need for hospitalisation, and convalescence. On the other hand, it is also well established that a significant learning curve is required for optimal results of laparoscopy, amounting to about 60 patients in colonic procedures and up to 100–200 patients with groin hernia repair. In addition, there may be increased direct costs from laparoscopy, which to some extent have been outweighed by the demonstrated postoperative benefits.

However, the main reason for a required new debate on the advantages of laparoscopy and the future strategies for further improvement is the concomitant developments within multimodal perioperative rehabilitation (i.e. fast-track surgery) [10, 12]. This concept, which ideally includes minimally invasive surgery (laparoscopy), combines improved preoperative patient information with optimal, dynamic pain relief, reduction of surgical stress responses,

revision of perioperative care principles adjusted to evidence (tubes, drains, restrictions, etc.) and revision of nurse care principles to utilise the benefits of stress reduction and pain relief into early oral nutrition and mobilisation [2, 10]. The concept has repeatedly been demonstrated to lead to major improvements in recovery of organ functions, reduction of medical morbidity, need for hospitalisation, and convalescence in a variety of procedures [8, 10]. In many areas, the results have been more impressive by this approach compared with the effects reported by laparoscopy and where revision of perioperative care principles were not reported or instituted. Thus, several fast-track colonic resection series have documented hospital stays between 2 and 4 days where randomised studies comparing a laparoscopic vs. an open approach have shown hospital stays of 5–7 and 7–9 days, respectively [8, 11].

One of the outcome parameters often quoted in randomised studies comparing open vs. laparoscopic surgery is postoperative convalescence. Although convalescence is an important outcome parameter, unfortunately most studies have insufficient or no information on postdischarge pain intensity, analgesic treatment or advice given for duration of convalescence. Thus, it is well established that the duration of convalescence is highly dependent on traditions and recommendations and several studies have documented a shorter duration of convalescence, for example after cholecystectomy or inguinal herniorrhaphy, when short recommendations have been given [5] compared with longer convalescence times reported in randomised studies. Most existing data from previous randomised studies are therefore difficult to interpret since the reported duration of convalescence may also depend on bias induced by surgeons or patients expecting shorter convalescence after a laparoscopic approach, but where the patients operated on with an open technique were often treated with traditional, unadjusted convalescence recommendations [5].

A logical approach to document the exact role of minimally invasive surgery is therefore a combined approach where laparoscopy is integrated with the principles of fast-track surgery [5, 10], thereby minimising the effects of traditional and restrictive care principles on functional recovery. Unfortunately, only two such randomised studies have been performed, where the surgical approach was blinded by an opaque abdominal dressing, thereby eliminating the bias from previous studies where surgeon and patient expectancies may have influenced the outcome results. One study in elderly high-risk colonic resection patients showed no differences in a detailed assessment of functional recovery, and with a median hospital stay of 2 days in both groups [1], significantly shorter than reported in previous unblinded, randomised studies [11]. The other study in appendectomy [4] did not show relevant clinical differences in outcome. A third randomised study [14] with blinding of the surgical approach in cholecystectomy did not include the

principles of multimodal rehabilitation and therefore showed no differences in outcome between a laparoscopic vs. an open technique, since hospital stay was 3 days in both groups and with 3–4 weeks' convalescence reflecting traditions of care, rather than the influence of the surgical approach per se [5].

So, what are the future strategies for further development and improvement of the effects of laparoscopy on outcome. First of all, laparoscopy should be combined with evidence-based principles of perioperative care (i.e. fast-track surgery) [2, 10, 11, 13]. Secondly, perioperative pain management should be further developed to be opioid-free, multimodal analgesia [6] in order to avoid opioid-related side effects and thereby improve functional recovery. In addition, such pain therapy should be procedure-specific, adjusted to available evidence [7]. Thirdly, future studies should combine laparoscopy and the principles of fast-track surgery with additional pharmacological modification of stress responses [9]. Thus, several techniques are available (i.e. glucocorticoids, beta-blockers, anabolic steroids, insulin, statins, etc.), all of which may further reduce hormonal as well as inflammatory responses, thereby aiming at a "stress and pain free" patient [9], with subsequent improvement in recovery and reduction in morbidity, hospital stay, and convalescence. Finally, evidence-based principles of perioperative fluid management should be integrated in such strategies [3], with a focus on early, goal-directed haemodynamic optimisation and balancing volume administration to avoid fluid excess and hypovolaemia [3].

In future outcome studies it is crucial to include a detailed description/revision of perioperative patient information (convalescence recommendations, etc.), techniques of perioperative analgesia, resource utilisation (nurse workload, direct and indirect costs, including additional postdischarge costs on readmission, use of home nurses, visits to general practitioners, etc.). Also potential benefits of laparoscopy on late sequelae such as bowel obstruction due to adhesions, chronic pain and ventral hernias must be assessed [11].

In summary, the future is open for further fascinating improvements in surgical outcome and where laparoscopy is a rational, but not the only component since the pathogenesis of perioperative morbidity includes multifactorial components [10]. Hopefully, minimally invasive surgeons will adopt the principles of multimodal rehabilitation in their daily clinical practice as well as in future research.

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