

Strategic Rest Break in Laparoscopic Surgery: A Need

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ABSTRACT

Laparoscopic surgery is a less painful surgery to patients but is more for the doctor. Surgeons feel fatigue and discomfort due to its technical complexity and ergonomics. Prolong duration of surgery and pneumoperitoneum creates the patient exhausted and causes some remarkable hemodynamic changes. During operation the strategic rest break after 90 minutes, for 5 minutes, increase the better outcome not only to patients but also to the doctor.

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INTRODUCTION

In the era of modern technology, laparoscopy is a gift from bioengineering to the surgeons. Kelling made a landmark in the history of surgery in 1901, by introducing visualizing scope to see the peritoneum of a dog¹ in 1987, Mouret, first successfully performed laparoscopic cholecystectomy.²

Patients comfort and safety is the first priority in this century. Laparoscopic surgery is technology advancement surgery and a better choice of mode of surgery nowadays. So, it is essential that we should obtain a clear understanding about the ergonomics as well as its potential problems, instrumental engineering, hemodynamic changes in patient and better postoperative outcome. Complexity of laparoscopy has some ill effect to the surgeon and patients.

ERGONOMICS

Ergonomic is a Greek word ergon means work and nomos means natural laws or the arrangements. Ergonomics is the scientific study of people at work in terms of equipment design, workplace layout, working environment, safety, productivity and training. It is combined systemic approach of anatomy, physiology, psychology and engineering. Studies have shown that correct ergonomics reduce the suturing time.³ Pressure-related chronic pain in surgeons has been shown relieved by the use of ergonomically design instruments⁴ so, it is important to understand the ergonomics for the surgeons for them and the best recovery of patients.

ERGONOMIC CHALLENGES DURING SURGERY

Laparoscopic surgery is the surgery of image. Its a two-dimensional surgery with no depth perception. There are only 4° of freedom. Static posture of surgeon also make surgeon inefficient. View of the operative field is also not under control of surgeon. Prolong duration of surgery makes the surgeon fatigue, decrease visual efficiency and irritable.

HEMODYNAMIC CHANGES OF PATIENTS DURING SURGERY

Investigators have demonstrated significant alterations of cardiac performance after peritoneal insufflations with CO₂ during laparoscopic procedures.^{5,6} Induction of anesthesia decreased significantly mean arterial pressure and cardiac index (CI). Tilting the patient to the head-up position reduced cardiac preload and caused further reduction of CI. Peritoneal insufflation resulted in a significant increase ($\pm 35\%$) of mean arterial pressure, a significant reduction ($\pm 20\%$) of CI and a significant increase of systemic ($\pm 65\%$) and pulmonary ($\pm 90\%$) vascular resistances. The combined effect of anesthesia, head-up tilt and peritoneal insufflation produced a 50% decrease in CI. Administration of increasing concentrations of isoflurane, via its vasodilatory activity, may have partially blunted these hemodynamic changes. These results demonstrate that laparoscopy for cholecystectomy in head-up position results in significant hemodynamic changes in healthy patients, particularly at the induction of pneumoperitoneum.

Elevated intra-abdominal pressure (IAP) causes the decrease in venous return and increases the systemic vascular resistance and decreases the myocardial performance leading to decrease in cardiac output.⁷ Increase in systemic vascular resistance may increase myocardial oxygen demand. But cardiac output does not appear to decrease significantly when is < 12 mm Hg.¹⁰ Minimizing the IAP should decrease the risk of potentially significant physiologic changes,⁸ numerous regional circulatory changes also occurs during laparoscopy including increased cerebral blood flow and increase ICP, decrease hepatic blood flow, bowel blood flow, renal blood flow and urine output, decrease femoral blood flow which may increase the risk of deep venous thrombosis (DVT).⁷ Increase in IAP causes upward displacement of the diaphragms, resulting in reduction of the lung compliance, FRC, increase airway resistance, ventilation perfusion mismatch with hypercarbia

and hypoxemia.⁸ Pneumoperitoneum increases risk of regurgitation and pulmonary aspiration.

COMPLICATIONS TO SURGEON

In adopting laparoscopic approach with its current limitations and poor ergonomics, surgeons have been known to sustain surgery-related injuries encompassed by a spectrum best described as MAS-related surgeon morbidity syndromes, some of which are currently overlooked and poorly researched. Equivalent morbidities including the overuse syndrome (from overuse of certain muscle groups during long operations) have been documented in open surgery but are nowadays rare occurrences. As more advanced MAS operations are performed with long execution times, new patterns of neuromusculoskeletal injuries are being recognized. The surgical fatigue syndrome has also been described, though its complex nature is not fully understood. Virtually little is known on other long-term adverse effects on the surgeon following many years of operating from images displayed on a television monitor or LCD screen, and these include deterioration of visual acuity and function of the ocular muscles responsible for fixation-refixation of the eyeballs. The limited reported literature on the MAS-related surgeon morbidity syndromes identifies certain risk factors for these injuries pertaining to central and peripheral domains. Laparoscopic surgeon especially women using glove sizes 6.5 or smaller, experience musculoskeletal problems while using common laparoscopic instruments.⁹

COMPERATIVE STUDY

It is a well-known factor that laproscopic surgery is far better than open surgery. Sometimes operative times goes longer than expected, in that case, surgeon as well as patient also suffer. Complex ergonomic makes the surgeon tired and due to prolong CO₂ based pneumoperitoneum and hemodynamic changes makes the patient tired. In a study, it is seen the common complaint from surgeon are as follows:

- Summary of avalidated questionnaire concerning the ergonomics of laparoscopic surgery
- Age, year, mean [range: 39 (33-56)]
- Laproscopic surgery experience, year, mean [range: 5 (1-20)]
- Laparoscopy workload, hour/week, mean [range: 10 (3-24)].

In patients with carbon dioxide pneumoperitoneum causes respiratory acidosis, presumably from absorption of the gas. Patel et al¹⁰ found that patients undergoing laparoscopic cholecystectomy were at high risk for developing DVT, with 40% having calf DVT and 15%

No. of complaints (0-5)*	Conventional laparoscopy
Musculoskeletal system pain	2.4 (1-4)
Neck pain	2.3 (1-4)
Shoulder stiffness	2.2 (1-4)
Arm pain	2.1 (1-4)
Forearm pain	1.8 (1-3)
Elbow stiffness	1.9 (1-3)
Hand pain	2.7 (1-4)
Wrist stiffness	2.4 (2-4)
Finger numbness	2.2 (1-3)
Back pain	3.3 (2-5)
Leg pain	3.3 (2-5)
Eye strain	1.8
Total score	31.6 (20-40)

0: No complaints; 1: Little pain; 5: Severe pain

having axial vein DVT on follow-up screening. Cardiac output decreases by up to 30% during laparoscopic surgery, due to a decrease in stroke volume. Pneumoperitoneum also causes an increase in systemic vascular resistance. As a result, mean arterial pressure remains unchanged or increases up to 16%. Patients with marginal cardiac performance may warrant invasive cardiac monitoring to assure they tolerate pneumoperitoneum. Joris et al¹¹ demonstrated that these hemodynamic changes were at least in part due to intravascular volume status and could be ameliorated by preloading patients with isotonic fluid and achieving pneumoperitoneum in the supine position rather than the reverse—Trendelenberg position.

DISCUSSION

You probably know you are ‘supposed to take breaks’. But you ask, ‘Why bother’? Many of us seem to prefer to plow through our work without interruption (and pass out at the end of the day). Barreling through ‘on a roll’ makes us feel productive and taking breaks seems like a waste of time. We continue this habit in the evening and lose track of time as we surf the internet, answer e-mails or concentrate on hobbies. After hours have passed, we ‘wake-up’ to realize that our eyes are tired, muscles are tight and our rear ends are flat. Put away that pain killer and take a break.

Research has shown that frequent breaks from 30 seconds to 10 minutes are beneficial.¹² The benefits include increased performance and reduced fatigue to the eyes, lower back, neck and wrists, especially when breaks were taken at 20 minutes intervals rather than at 40 minutes intervals.¹³⁻¹⁷ Productivity is either unaffected or actually

improved when additional breaks are taken.^{13,18,19} In fact, in one study conducted by Alan Hedge at Cornell's Human Factors and Ergonomics Laboratory, use of computer-initiated microbreaks showed a 13% average improvement in accuracy, with faster computer workers showing the greatest improvement.

WHAT TYPE OF BREAK IS BEST?

There are two types of breaks: Microbreaks last between 30 seconds and 5 minutes, while longer breaks are 10 to 15 minutes. Several studies have proven the effectiveness of breaks in reducing the risk of over use injuries. However, there is no consensus regarding the best length or frequency.

1. Forearm, wrist and hand discomfort occurring over the course of the work week with two 15 minutes breaks during an 8-hour work day were eliminated when data entry operators added 5 minutes breaks every hour. In addition, there was no reduction in productivity when the microbreaks were included in the day.
2. 'Micropauses' of 15 seconds taken every 10 minutes reduced fatigue at the end of a shift of data entry work by 50%.¹²
3. Frequent pauses are effective, if they are taken before the onset of appreciable fatigue.
4. Frequent pauses of 1.5 minutes resulted in a productivity increase of 6.45%. Pauses 2 minutes long produced a productivity increase of 11.15%.²¹
5. The optimal rest break length for infrequent rest pauses taken every 80 minutes is approximately 6 minutes.^{20,22}
6. Either 5 minutes breaks every 30 or 10 minutes breaks every hour resulted in similar reports of worker comfort and measures of accuracy. The 10-minute breaks each hour were less disruptive to work.⁷

To summarize, what matters most is that you break from a particular task to improve circulation and refresh your mind and body. If you break less frequently, such as once per hour, you will need to break longer, from 6 to 10 minutes, than if you break more frequently it has long been assumed that hard-working and competitive 'Type A' people would avoid taking breaks.

National Institute for Occupational Safety and Health (NIOSH) reports in a new study. The findings are published in the May 2000 issue of the Scientific Journal Ergonomics. Regular daily schedule that included two 15 minutes rest breaks, one in each half of the work shift. In the other schedule, the conventional breaks were supplemented with four 5-minute breaks spaced throughout the workday. The workers consistently reported less eye soreness, visual blurring and upper-body discomfort under the supplementary schedule.

During operation if the surgeon takes a break for 5 minutes after each 90 minutes, during this period patients positions should be changed into supine position, all the CO₂ gas should be out take out all the instrument, patient will be under anesthesia, doing this we can prevent to form DVT, microatelectasis, slow growing cerebral edema and respiratory acidosis. Even we can change the hemodynamic status of the patient. Chances of the pulmonary embolism also decrease. Blood flow to the important organs backs to normal.

The strategic rest break for the surgeon is to remember breath and feel relax. Posture and ergonomic status are changed which causes less lactic acidosis and build-up toxins production. Muscle feel relaxed and neck pain, eye strain also reduce.

Prof Dr RK Mishra, director, World Laparoscopy Hospital, advocated for rest break after 45 minutes, for 5 minutes, in laparoscopic surgery. He has seen that after the operation patient face look fresh and postoperative recovery is very good and quicker.

Dr Joice P Hanna and Dr Cuschieri also advocated for this kind of rest break.

CONCLUSION

Knowledge of pathophysiological changes, adequate monitoring and good planning in surgery with strategic rest break improve the outcome of the patients and surgeon can perform the surgery for long-term. Though it takes little more longer time than usual to complete of surgery but for the benefit of surgeon and patient, its shows no merit to probe this data, much more clinical study is needed to establish this strategic rest break for the benefit of patients and surgeon.

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