Minimally invasive surgery in the treatment of gastric cancer

Unlike benign pathology, progress of laparoscopy in performing cancer surgery has been slow because of fear of safety and oncological adequacy. However, the initial fear has been replaced by optimism as the results from numerous studies have shown equivalent if not superior results to open surgery. Laparoscopic gastrectomy is safe and oncologic adequate, but time consuming and technically demanding procedure.

Laparoscopic surgery has gained wide acceptance in the treatment of early gastric cancer, especially of the distal stomach. The use of laparoscopic surgery for the treatment of advanced gastric cancer remains controversial. Another open question that need complete evaluation is cost-effectiveness analysis of minimally invasive and open approach.

Key words: surgery, minimally invasive surgery, stomach neoplasms, gastrectomy

INTRODUCTION

Since laparoscopic cholecistectomy became the golden standard in treatment of cholelithiasis, minimally invasive surgery has become ever popular in treatment of not only benign, but also some malignant diseases. The advantage of minimally invasive surgery is not related only to avoidance of big surgical incision, but also to a significant decrease of operative trauma and consecutive inflammatory response and pain, which positively affects the reduction of postoperative complications, decrease hospital stay and increase quicker return to normal activities and patient satisfaction.

Unlike benign pathology, progress of laparoscopy in cancer surgery has been slow because of the fear for safety and oncological adequacy in comparison to already proven open procedures. However, the initial fear has been replaced by optimism as the results from a numerous studies have shown equivalent, if not superior, results to open surgery.

When malignant pathology of gastric cancer is in question, minimally invasive procedures were initially introduced as a diagnostic tool in staging of the disease. Staging laparoscopy increased accuracy of other diagnostic procedures, primarily of computerized tomography in the detection of peritoneal seeding.

As surgical experience increased, diagnostic procedures were replaced by therapeutic procedures. The first series of Billroth I operations was published by Kitano et al. in 1994. Initial experience opened the door to introducing other, more complex, minimally invasive surgical procedures in treatment, at first for benign and afterwards malignant gastric diseases. Watson et al. published series of Billroth II operations in 1995, Choi et al. a laparoscopically assisted subtotal gastrectomy the next year, and Uyama et al. a laparoscopic D2 gastrectomy in 1999. In the period from 1991-2003, 7800 minimally invasive surgical procedures for patients suffering from gastric cancer, were performed in Japan.
As prevalence of gastric cancer in general, especially early cancers is highest in Japan, the most important study of importance of minimally invasive limited resection was conducted in Japan. In the period from 1992 to 2001, Japanese Association for Endoscopic Surgery conducted a study that included over 1400 patients with mucosal cancer, with the goal of assessment of significance of LWR and IGMR in the treatment of small mucosal gastric cancers. LWR was conducted with 1428 patients and IGMR with 26. The criteria for exclusion from the study were: submucosal invasion or invasion of lymphatic or blood vessels confirmed by endoscopic biopsy, cancer diameter $\geq 3$ cm, non-differentiated histological type and presence of ulceration. Notwithstanding strict clinical and histological criteria, with as much as 20% of patients conversion to open gastrectomy had to be made after LWR or IGMR. The criteria for the conversion to open radical procedure were: histologically positive resection line, subsequent histologically proven invasion of vein or lymphatic vessels in the gastric wall and invasion of middle or deep submucosal layer of gastric wall.

Due to high ratio of conversion and advancement in endoscopic and minimally invasive surgical techniques (laparoscopic resection of stomach and lymphonodal dissection), LWR and IGMR conceded their place to less invasive laparoscopic and minimally invasive surgical techniques (laparoscopic and hand-assisted laparoscopic gastrectomy). In contemporary literature different minimally invasive procedures in treatment of gastric cancer can be found: total laparoscopic gastrectomy, laparoscopically assisted gastrectomy and hand-assisted laparoscopic gastrectomy. In addition, the surgical procedures vary widely in respect to extent of resection and especially lymph nodal dissection.

Through insight to available medical literature we found two meta-analysis that evaluate the laparoscopic distal gastrectomy in gastric cancer treatment. One was published by Hobson et al. from Osaka (Japan) and published it in World Journal of Surgery in 2006, and the other by Mohamed Memo et al., from Queensland (Australia) and published it in Surgical Endoscopy in 2008.

What is the conclusion of these studies? The duration of laparoscopic distal gastrectomy (LADG) is significantly greater than open gastrectomy (OG). It has considerable implications to patients as well as medical services. Increased duration of surgery and exposure to prolonged anesthesia increases morbidity and probably mortality in category of older patients with substantial associated comorbidity. Increase duration of surgery and anesthesia significantly increases both direct costs of surgical procedure and overall treatment costs.

The duration of LADG is probably in direct correlation with phase of learning curve, since LADG is a relatively new procedure. With growth of experience in LADG reduction of surgery duration is to be expected.

When intraoperative blood loss is analyzed, the greatest number of studies agrees that LADG is associated with less blood loss in comparison to OG. Negative effect of blood transfusion on survival after surgical resection for cancer is well known, however the mechanism of immunomodulatory effect is still not totally explained.

Oncological adequacy of resection procedure is based on possibility to ensure cancer free resection margins and adequate lymphonodal dissection. Assessment of safe resection line during LADG is being assessed the same way as during OG. In addition, it is a generally accepted that standard D2 dissection is possible to perform laparoscopically. A particular problem that initially was attached to laparoscopy are "port-site" metastasis. Up to the introduction of protective sack, extraction of tumor through relatively narrow opening in abdominal wall in stigmated embedding of cancer cells into the abdominal wall and a higher percent of local disease relapse. Nowadays, the protective sac is standardly used during the extraction of the tumor from the abdominal cavity.

The duration of LADG is probably in direct correlation with phase of learning curve, since LADG is a relatively new procedure. With growth of experience in LADG reduction of surgery duration is to be expected.

When intraoperative blood loss is analyzed, the greatest number of studies agrees that LADG is associated with less blood loss in comparison to OG. Negative effect of blood transfusion on survival after surgical resection for cancer is well known, however the mechanism of immunomodulatory effect is still not totally explained.

Oncological adequacy of resection procedure is based on possibility to ensure cancer free resection margins and adequate lymphonodal dissection. Assessment of safe resection line during LADG is being assessed the same way as during OG. In addition, it is a generally accepted that standard D2 dissection is possible to perform laparoscopically. A particular problem that initially was attached to laparoscopy are "port-site" metastasis. Up to the introduction of protective sack, extraction of tumor through relatively narrow opening in abdominal wall in stigmated embedding of cancer cells into the abdominal wall and a higher percent of local disease relapse. Nowadays, the protective sac is standardly used during the extraction of the tumor from the abdominal cavity.

The duration of LADG is probably in direct correlation with phase of learning curve, since LADG is a relatively new procedure. With growth of experience in LADG reduction of surgery duration is to be expected.

When intraoperative blood loss is analyzed, the greatest number of studies agrees that LADG is associated with less blood loss in comparison to OG. Negative effect of blood transfusion on survival after surgical resection for cancer is well known, however the mechanism of immunomodulatory effect is still not totally explained.

Oncological adequacy of resection procedure is based on possibility to ensure cancer free resection margins and adequate lymphonodal dissection. Assessment of safe resection line during LADG is being assessed the same way as during OG. In addition, it is a generally accepted that standard D2 dissection is possible to perform laparoscopically. A particular problem that initially was attached to laparoscopy are "port-site" metastasis. Up to the introduction of protective sack, extraction of tumor through relatively narrow opening in abdominal wall in stigmated embedding of cancer cells into the abdominal wall and a higher percent of local disease relapse. Nowadays, the protective sac is standardly used during the extraction of the tumor from the abdominal cavity.
When LADG and OG complications are compared, meta-analysis has shown greater occurrence of perioperative complications after OG, but the difference is not statistically significant. Lower occurrence of overall complications is addressed to the lower occurrence of problems related to operative incision, respiratory complications and ischemic heart disease. Technical problems attached to laparoscopic creation of esophagogastrostomy, were overcome with time.

Since the inflammatory response after LADG is significantly lower than after OG, the adhesion rate is also lower. It causes rarer occurrence of late postoperative ileus in a group of surgically treated with minimally invasive techniques, however the difference in relation to OG is statistically not significant since in overall, late postoperative ileus after the surgery of malignant gastric disease is a relatively rare phenomena.

Lastly, there is no significant difference in mortality after the laparoscopic and open distal gastrectomy.

CONCLUSION

Laparoscopic gastrectomy is a safe and oncologically adequate, but technically demanding and time consuming procedure. It is reserved for surgeons with experience in open surgery of malignant gastric diseases and surgeons with major experience in advanced laparoscopic procedures. Even then, the learning curve is long. Despite all that, the ever greater number of surgeons around the world accepts the minimally invasive approach in treatment of this disease.

Most comparative studies relate to early gastric cancers and cancers of distal part of stomach. The importance of laparoscopic gastrectomy in the treatment of invasive gastric cancer is still undefined and therefore, remains a topic full of controversies. Because of this, comprehensive multicentric randomized control trials are needed. Another open question is the one of cost-effectiveness of laparoscopic and open gastrectomy and it requires thorough evaluation.

SUMMARY

MINIMALNO INVAZIVNA HIRURGIJA KARCINOMA ŽELUCA

Za razliku od benigna patologije, napredak minimalno invazivne hirurške lećenje u lećenju malignih tumora bio je usporen zbog straha od bezbednosti i onkološke opravdanosti minimalno invazivnih tehnika uomedju, incijalni strahn je optimiziran aszovan na brojnim studijama koje su dokazale jednake, ako ne i superiornoe rezultate u odnosu na otvorene procedure. Laparoskopska gastrektomija je sigurna i onkološki adekvatna ali tehnički i vremenski zahtevna procedure. Većina komparativnih studija odnosi se na rane karcinome želuca i karcinome distalnog dela želuca. Značaj laparoskopske gastrektomije u lećenju invazivnog carcinoma želuca još nije definisan i stoga i dalje ostaje tema puna kontroverzi. Još jedno otvoreno pi-

tanje je odnos troškova i efekata laparoskopske i otvorene gastrektomije i ono zahteva kompletnu evalu-aciju.

Ključne reči: hirurško lećenje, minimalno invazivna hirurška, neoplazme želuca, gastrektomija

REFERENCES


