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Reoperation after gastrostomy tube insertion in children: A single center 5-year retrospective analysis

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Abstract

Introduction: A gastrostomy tube placement is a frequently performed procedure to benefit children with feeding difficulties. The majority of these children have a significant neurological impairment. There are many complications associated with the gastrostomy tube insertion such as bowel injury, early tube dislodgement, intraperitoneal leakage either before and after gastrostomy tube exchange, persistent gastrocutaneous fistula which requires reoperation under general anesthesia. **Aim of the work:** Assessment of incidence and risk factors of complications associated with the gastrostomy tube placement requiring reoperation. **Patient and methods:** All Patients underwent surgical gastrostomy tube insertion either by open or laparoscopic-assisted approach in the Pediatric Surgery department, Mansoura University Children's Hospital were included. The study was performed by reviewing patients' medical records during the period from Jan 2017 to June 2022. One hundred forty seven patients were included in this study and were divided into two groups: *Group A* refers to patients operated by the open approach. *Group B* refers to cases operated by the laparoscopic-assisted approach. **Results:** This study included 147 patients who underwent gastrostomy. *Group A* included 93 patients with mean age of 12.8 \pm 12 months. *Group B* included 54 patients with mean age of 35 \pm 12 months. In *Group A*, number of male patients was 53 with percentage (56.9%) while number of female patients was 40 with percentage (43.01%), while in *Group B*, number of male patients was 29 with percentage (53.7%) while number of female patients was 25 with percentage (46.3%). The mean operative time for *group A* was 48.2 \pm 4.0 min, while in *group B* was 24.8 \pm 3 min. Postoperative complications occurred in 29 cases (31.18%) in *group A* compared to 22 cases (40.74%) in *group B*. Incidence of gastrostomy related major complications requiring reoperation in *group A* was 15.05% (14 patients), while in *group B* was 22.2% (12 patients). **Conclusions:** Laparoscopic assisted gastrostomy tube insertion offers fast, safe and efficient approach with no statistically significant difference in major complications compared to the open approach.

Introduction

A gastrostomy tube placement is a frequently performed procedure to benefit children with feeding difficulties. The majority of these children have a variable degree of neurological impairment. Less frequent indications are an inadequate caloric intake in children with chronic medical diseases, failure to thrive, esophageal atresia and esophageal stricture (1). An open surgical gastrostomy was first described by Stamm in 1894 (2).

Until the early 1980s, when the percutaneous endoscopic gastrostomy (PEG) was introduced, because of its simplicity and effectiveness, PEG has since been considered the method of choice. This procedure reduced the morbidity of a large incision, although the risk of perforation of adjacent intestinal loops or development of entero-enteric fistula remains a concern (3). The laparoscopic approach for placement of a gastrostomy tube was first described in 1991 by several different authors. This technique provided a means of ensuring safe placement of the feeding tube under direct vision without the morbidity of a sizable incision. In most contexts, it has become the procedure of choice for a gastrostomy tube placement in children (4).

There are many complications associated with the gastrostomy insertion such as bowel injury, early tube dislodgement, intra-peritoneal leakage either before and after gastrostomy tube exchange, persistent gastro-cutaneous fistula which requires reoperation under general anesthesia (5).

Aim of the work.

Assessment of incidence and risk factors of complications associated with the gastrostomy tube placement requiring reoperation.

Patients and methods.

All Patients underwent surgical gastrostomy tube insertion either by open or laparoscopic-assisted approach in the Pediatric Surgery department Mansoura University Children's Hospital were included. The study was performed by reviewing patients' medical records during the period from Jan 2017 to June 2022.

One hundred forty seven patients were included in this study and were divided into two groups: *Group A* refers to patients operated by the open approach. *Group B* refers to cases operated by the laparoscopic-assisted approach.

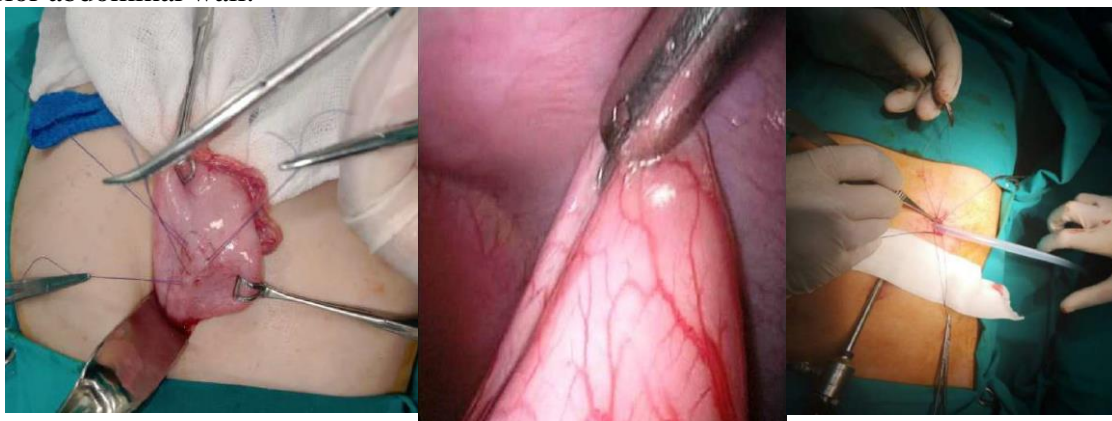
Surgical Technique:

1-Open gastrostomy: a) A small vertical incision was done in the midline half way between the umbilicus and the xiphoid process. b) The anterior wall of the stomach was identified and a suitable anatomic location for the gastrostomy was identified. The site should be placed in a dependent portion of the anterior wall of the stomach on the mid body of the stomach for the catheter insertion. c) The catheter exit site should be performed at the junction of the lower two thirds and the upper one third of a line extending from the umbilicus to the mid portion of the left rib cage. e) Two stay sutures were done at the selected site in the stomach. Two concentric purse string sutures were placed using absorbable suture 3/0 Vicryl®, then a small incision was made on the abdominal wall several centimeters from the original incision.

2-Laparoscopic-assisted gastrostomy:

A 5 mm trocar was inserted at the umbilicus for a 30 degrees' scope. b) Carbon dioxide was insufflated to a pressure of 6–12 mm Hg (depending on the size of the child) & insufflation rate at 1.5-2 L/min. d) An a traumatic grasper was introduced at the gastrostomy tube site in the left upper quadrant of the abdomen, between the umbilicus and the costal margin, c) A grasper was

used to grasp the gastrostomy site which was selected properly under vision. The grasped gastric wall was pulled to allow the gastrostomy site to be exteriorized outside the abdomen. d) Two stay sutures anchored the anterior gastric wall and a purse string suture was inserted in the exposed stomach. Then, 4-8 sutures were taken between the stomach and the anterior rectus sheath or the external oblique aponeurosis to secure fixation of the gastrostomy site to the anterior abdominal wall.



a- Open gastrostomy

b- lap gastrostomy

c- lap gastrostomy tube

The medical records were reviewed for the age, body weight, indication for gastrostomy, operative time and major complications which required reoperation. Data analysis was performed by SPSS software, version 22 (SPSS Inc., PASW statistics for windows version 22. Chicago: SPSS Inc.). Qualitative data were described using number and percent. Quantitative data were described using mean \pm Standard deviation for normally distributed and median with range (or interquartile range) for abnormally distributed data after testing normality using Kolmogrov-Smirnov test. Significance of the obtained results was judged at the (≤ 0.05) level. Chi-Square, Fisher exact tests were used to compare qualitative data between groups as appropriate. Student t test was used to compare 2 independent groups for normally distributed data and Mann Whitney test for abnormally distributed data.

Results.

This study included 147 patients who underwent gastrostomy. The commonest indication for gastrostomy was Neurological causes (cerebral palsy) 82 patients (55.8%), followed by Esophageal atresia in 36 patients (24.5%). Other causes included post corrosive esophageal stricture in 27 patients (18.4%), while two patients underwent gastrostomy due to iatrogenic trauma during endoscopic foreign body extraction. (table 1)

Indications	N=147	%
Neurological causes	82	55.8
esophageal atresia	36	24.5
post corrosive	27	18.4
iatrogenic trauma due to F.B extraction	2	1.4

Group A included 93 patients with mean age of 12.8 \pm 12 months while group B included 54 patients with mean age of 35 \pm 12 months, with statistically significant difference between both groups ($p = 0.001$). In Group A, number of male patients was 53 with percentage (56.9%) while

number of female patients was 40 with percentage (43.01%), while in *Group B*, number of male patients was 29 with percentage (53.7%) while number of female patients was 25 with percentage (46.3%). The mean operative time for *group A* was 48.2 ± 4.0 min, while in *group B* was 24.8 ± 3 min which is statistically significant difference between both groups ($p = 0.001$). The body weight at time of operation ranges from 1.5 to 18 kg with the mean body weight in *group A* was 4.5 ± 3 and in *group B* was 9 ± 2 , with statistically significant difference between both groups ($p = 0.002$). Overall postoperative complications in *group A* were 29 (31.18%) of 93 cases, while in *group B* were 22 (40.74%) of 54 cases. P value .241 Almost 50 % of these complications were minor complications that were treated without need of further reoperation. These reported complications included surgical site inflammation and granuloma formation, 16% in *group A* and 18.5 % in *group B* which was treated by topical antibiotics and barrier cream The commonest minor complication was external leakage around the gastrostomy tube which in most cases treated conservatively by changing the gastrostomy tube to smaller one aiming to shrink the stoma and then reinsertion of the same diameter previously inserted tube. Incidence of gastrostomy related major complications requiring reoperation in *group A* was 15.05% (14 patients), while in *group B* was 22.2% (12 patients) P value 09. In the patient with duodenal perforation it was discovered in the 3rd day postoperatively by sudden severe abdominal distention and pneumoperitoneum in abdominal xray , and was managed by duodenal repair through open approach.

Table (2): Minor postoperative complications according to operation type.

Minor post-operative complications	Group A = 15(16.1%) of 93	Group B, n= 10 (18.5%) of 54	Test of sign 0.076	P value 0.782
Stoma site granuloma	9 (9.6%)	7(12.96%)	0.380	0.537
surgical site infection	6 (6.45%)	3(5.55%)	0.047	1.0

Table (3): Major postoperative complications required reoperation

Complications	Open N=93	Lap N=54	P value
Internal leakage	1(1.1%)	3(5.6%)	0.107
External leakage	6(6.5%)	7(12.9%)	0.180
Visceral injury (duodenum)	2 (2.2%)	0	0.532
Gastro-cutaneous fistula	5 /32 (15.6%)	2 / 12 (14.3%)	0.907

Used tests: Chi-Square test and its correction by Fisher exact test, Student t test

There were no significant differences in the reoperation rate between both groups.



a-Stomal site granuloma b- Persistent gastro cutaneous fistula

Discussion.

As regard the age of presentation of patients involved in this study, the mean age at the time of the procedure was 12.8 ± 12 months in *group A* and 35 ± 12 months in, which was statistically significant between both groups. This was less than the mean ages reported by most of the other studies as in Liu et al., 2013 ranging from 2 to 4.5 years. This may be due to the large number of gastrostomies performed for cases of esophageal atresia at neonatal period in our study. As regards patients' sex distribution, a male predominance was noted in the study./ The total male to female ratio was approximately 1.3:1 the same ratio was found also in each group. In Liu et al., 2013, 54.2 % were males and (46.8 %) females. This reveals that the male patients were slightly higher than females similar to other studies. As regard the indication of gastrostomy, in this study 24.5% of children who required gastrostomy had esophageal atresia, 55.8% of children were neurologically impaired and 18.4% were due to post corrosive esophageal stricture. There was no statistically significant difference between the two groups. These results were similar to other studies as in Liu et al., 2013 (6) study in which 59 % of the children who required a gastrostomy were neurologically impaired. In Sulkowski et al.,(7) 2016 study, 50.6% of children who required a gastrostomy were neurologically impaired. We found that the total rate of postoperative complications in *group B* were 22 (40.74%) of 54 cases, while in *group A* was 29 (31.18%) of 93 cases with overall complications in both groups were 51 patients with percentage (34.69%). Comparing the two groups revealed a non-significant statistical difference with P value of 0.75. Those numbers were comparable to the numbers published by Liu et al., 2013 (6) where the total complications incidence of the open group was 20% and 22% in the laparoscopic group. While the numbers published by Sulkowski et al.,2016 (7) were (18%) in the open group and (12%) in the laparoscopic one.

In this study, *group A*, there were two patients (2.2%) with visceral injury (one gastric injury and one duodenal perforation) and no cases with intraoperative bleeding, while in *group B*, there was no reported visceral injury during laparoscopic approach and those results are in agreement with the result in the study done by (Mizrahi et al., 2014) (9) gastric perforation occurred in one case with open technique representing .06% and no cases with laparoscopic technique. In our study, there were four recorded cases of intraperitoneal leakage, one case belonged to *group A* with a percentage of 1.1%, while three patients belonged to *group B* with percentage 5.6%, those results are in agreement with the results of Sulkowski et al., 2016 (7) which recorded two cases of intraperitoneal leakage in laparoscopic technique representing 2.3% and no cases in open technique. While in other studies as Liu et al., 2013 and Franken et al., 2015 (6,8) no cases with intraperitoneal leakage occurred in both groups. In this study, there were nine recorded cases of

surgical site infection, six cases belonged to open group with a percentage of 6.4% and three cases belonged to laparoscopic group with a percentage of 5.55%, those results were slightly lower than with other studies as the study of Liu et al., 2013 (6) there were 9.2 % of the patients with surgical site infection in the laparoscopic group and 8.7% in the open group. As regards stoma site granuloma in this study, it occurred in 16 cases (11.7%), nine cases belonged to the open group with a percentage of 9.6% and seven cases belonged to the laparoscopic group with a percentage of 12.96%. The difference was statistically insignificant; those results are in agreement with the results of Liu et al., 2013 (6) which recorded 13% of cases in the open group and 14.2 % in the laparoscopic group. Another study by Sulkowski et al., 2016 (7) showed high incidence of granuloma formation, it recorded granuloma in 42 % of cases in open group and 36% of cases in laparoscopic group. As regard persistent peristomal leakage not responding to conservative treatment, in our study, there were six (6.5%) in group A and seven (12.9%) in group B recorded cases of peristomal leakage, The difference was statically insignificant between both groups ($p = 0.180$). Those cases required reoperation with closing of the original gastrostomy site and performing a new gastrostomy. Those results were lower than other studies as Sulkowski et al., 2016 (7) study recorded peristomal leakage in 12 % of cases in open group and 25% of cases in laparoscopic group. Liu et al., 2013 (6) study recorded 43.5 % of cases with peristomal leakage in the open group and 17.7 % of cases in the laparoscopic group. As regard Persistent gastro-cutaneous fistula, in our study by considering that 44 cases (29.9%) only underwent gastrostomy tube removal and properly followed up for more than 2 months, so there were seven recorded cases of persistent gastro cutaneous fistula after removal of gastrostomy tube with percentage 15.9%, five cases in group A with percentage 15.6%. and two cases in group B with percentage 14.3%. The difference between two groups was an insignificant difference in comparison ($p = 0.907$). These cases are arranged for closure of fistula but longer follow-up is required. These results were in agreement with (Sheir et al., 2020) (11) who used the same laparoscopic assisted technique. The incidence of persistent gastro-cutaneous fistula in this study was 12.5 %. Some authors reported higher incidence up to 60% in Kim et al., 2017 (12) study after surgically inserted gastrostomy whether open or laparoscopic, and this was statistically significant when compared with the endoscopic insertion group.

Conclusion.

Laparoscopic assisted gastrostomy tube insertion offers fast , safe and efficient approach with no statistically difference in major complications between laparoscopic and open approach. Moreover, this technique seemed to be equally safe in neonates and infants. It has supreme aesthetic outcome and less wound complications but carry slightly higher complications than open. The standard open approach showed slower time with longer recovery period.

References

- 1-Gauderer, M.W. (2019). Gastrostomy. In: Prem Puri, Michael E. Höllwarth (eds.) Pediatric Surgery. 2nd ed. Springer, Berlin, Heidelberg, (pp. 175-184).
- 2-Grant, J. P. 1988. "Comparison of percutaneous endoscopic gastrostomy with Stamm gastrostomy." *Annals of surgery* 207(5), 598.
- 3-Beres, A., Bratu, I. and Laberge, J.M. 2009. Attention to small details: big deal for gastrostomies. *Seminars in Pediatric Surgery* 18, 87-92.
- 4-Jones, V., E. La Hei and A. Shun .2007. "Laparoscopic gastrostomy: the preferred method of gastrostomy in children." *Pediatric surgery international* 23(11): 1085-1089.

- 5-Kandil, E., H. Alabbas, C. Jacob, P. Friedlander, J. Duchesne, V. Joshi and C. Bellows .2010. "A simple and safe minimally invasive technique for laparoscopic gastrostomy." *JSLs: Journal of the Society of Laparoendoscopic Surgeons* 14(1): 62.
- 6-Liu, R., Jiwane, A., Varjavandi, A., Kennedy, A., Henry, G., Dilley, A ., Currie, B., Adams, S. & Krishnan, U. 2013. Comparison of percutaneous endoscopic, laparoscopic and open gastrostomy insertion in children. *Pediatric surgery international*, 29, 613-621.
- 7-Sulkowski, J. P., A. C. De Roo, J. Nielsen, E. Ambeba, J. N. Cooper, M. J. Hogan, S. Erdman, K. J. Deans, P. C. Minneci and B. Kenney .2016. "A comparison of pediatric gastrostomy tube 8-placement techniques, *Pediatric surgery international* 32(3): 269-275.
- Franken, J., Mauritz, F. A., Suksamanapun, N., Hulsker, C. C., van der Zee, D. C. & van Herwaarden-Lindeboom, M. Y. 2015. Efficacy and adverse events of laparoscopic gastrostomy placement in children: results of a large cohort study. *Surgical endoscopy*, 29, 1545-1552.
- 9-Mizrahi, I., M. Garg, C. M. Divino and S. Nguyen .2014. "Comparison of laparoscopic versus open approach to gastrostomy tubes." *JSLs: Journal of the Society of Laparoendoscopic Surgeons* 18(1): 28.
- 10-Wragg, R. C., Salminen, H., Pachl, M., Singh, M., Lander, A., Jester, I., Parikh, D. & Jawaheer, G. 2012. Gastrostomy insertion in the 21st century: PEG or laparoscopic? Report from a large single-centre series. *Pediatric Surgery International*, 28, 443-448.
- 11-Sheir, H. M., T. A. Wafa, A. Elshafey and M. Elzohiri .2020. "A simplified laparoscopic-assisted gastrostomy technique: a single center experience." *Annals of Pediatric Surgery* 16(1): 1-5.
- 12-Kim, J., Koh, H., Chang, E. Y., Park, S. Y. & Kim, S. 2017. Single center experience with gastrostomy insertion in pediatric patients: a 10-year review. *Pediatric gastroenterology, hepatology & nutrition*, 20, 34-40.