Should Gastrojejunostomy Tubes be Changed Every Three Months?

A Two-Year Single Institution Retrospective Analysis of Unscheduled Gastrojejunostomy Tube Changes

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Should Gastrojejunostomy Tubes be Changed Every Three Months? A Two-Year Single Institution Retrospective Analysis of Unscheduled Gastrojejunostomy Tube Changes

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Abstract:

Background: To date there is a significant lack of data on the best practices for maintaining gastrojejunostomy tubes (GJ) in pediatric medicine.

Purpose: To determine the average longevity of a GJ tube, the reasons for GJ tube change, and the cumulative radiation dose associated changes.

Methods: A single institution retrospective chart review of patient data over a two-year period was performed utilizing an MPower database to identify GJ exchanges/replacements. An exchange was defined as a correctly positioned GJ tube and replacement as a mispositioned GJ tube. The patients' age, fluoroscopy time, time between change, brand of tube, and reason for replacement were recorded and statistical analysis performed.

Results: 143 patients were identified, with a total of 534 GJ changes performed. There were 331 exchanges and 203 replacements. The average length between procedures was 140.6 days with an average fluoroscopy time of 1.76 minutes. Cumulative fluoroscopy time annually was significantly higher if a patient needed a replacement (11.4 minutes) versus an exchange (0.92 minutes). G-JET® brand was more likely to malfunction (8.9%) due to a valve issues compared to MIC-KEY® (3.3%), $p = 0.03$. MIC-KEY® was three times more likely (OR = 3.01) to be replaced for malposition or leaking, $p= 0.009$.

Conclusion: Current guidelines set by manufacturers can be extended from 3 months to nearly 5 months. Tube replacements result in significantly higher radiation exposure compared to exchanges. Further studies are needed to ascertain whether scheduling has a lower rate of exchanges vs not scheduling.

Introduction:

Supplemental enteral nutrition has had a significant evolution and extensive history in medicine, with the humble beginnings of provision of supplemental nutrition delivered via enemas. Around the mid-to-late 1800s, the surgical placement of the gastrostomy feeding tube was developed. Today, gastrojejunostomy (GJ) tubes are one of the most common procedures performed in the pediatric interventional radiology department. Placement of a GJ tube is performed in patients, who for a variety of reasons, such as prematurity, failure to thrive, neurologic or neuromuscular disorders, gastroesophageal reflux, and neoplastic disease, do not tolerate oral or gastric feeds [1, 2]. Over the years, there have been numerous advances in gastrostomy tube placement, with methods and procedures that are less invasive and that have fewer complications. For many patients, GJ tubes are an essential part of long-term care due to chronic medical conditions [3].

Despite advances in techniques for minimally invasive procedures, there continue to be risks associated with both placement and replacement of GJ tubes. In particular, patients younger than six months and/or weighing less than 6 kilograms are at an increased risk for recurrent dislodgment and devastating intestinal perforation [4]. One retrospective study examined visits to an Emergency Department for GJ tube complaints and discovered patients with GJ tubes have approximately 1.25 visits per year directly related to tube complications, most commonly tube dislodgement. Of the 181 patients in the study, approximately 75% needed GJ tube replacement [5].

GJ tubes are manufactured by two dominant companies: Applied Medical Technologies (AMT) (City, Country) and Avanos Medical (City, Country). AMT supplies the tube branded as G-JET®, and Avanos produces the MIC-KEY® tube. The overall general design for both products is quite similar. Both G-JET® and MIC-KEY® brand tubes are dual-lumen with the gastric (G) lumen ending just beyond the retention balloon, and the jejunal (J) lumen terminating at the distal tip of the tube. On the exterior there are three ports: one port for each of the feeding lumens and the third port for inflating the balloon.

In addition to evaluating mechanical complications such as valve breakage, balloon rupture, tube cloggage and generalized leaking, from a procedural standpoint, it is very important to consider fluoroscopy time as well as total dose (total Air Kerma for example) for each tube change. According to a retrospective review of 146 patients, the presence of a mechanical complication with the tube had a significant correlation with an increased radiation exposure and fluoroscopy time [6]. However, there is a paucity of data relating to the ideal timing of GJ tube changes, with the companies suggesting scheduled changes every 3 months. [7] The ideal timing of replacing a GJ tube in the pediatric population continues to evolve [8,9]. The focus of this study was to independently determine the average duration of a GJ tube and evaluate the effectiveness and safety of not scheduling a routine change.

Materials and Methods:

A retrospective chart review of patient data from June 1, 2017 to May 31, 2019 was performed. Every pediatric patient at a single institution who had a GJ tube replacement/exchange was identified in a MPower database. The institution from where data was collected does not

routinely schedule GJ tube replacements/exchanges and is a non-profit children's hospital with 433 licensed inpatient beds, and 367,610 outpatient visits in 2019. The study was IRB exempt.

A replacement was defined as the tube being dislodged from its ideal location and requiring complete removal and placement of a new GJ tube. An "exchange" was defined as a tube that needed to be changed for any one of several reasons but was in correct position and could simply be exchanged over a wire for a new GJ tube. The term "replacement" was defined as a tube that needed to be changed because of partial or complete displacement from the correct location, requiring use of a directional catheter and wire to place a new GJ tube. Each identified patients' medical record was evaluated to determine the number of GJ replacements/exchanges they received during the given time frame. All data was transferred in a deidentified form. Each patients' age, sex, ordering service, cumulative fluoroscopy time in minutes, dose area product of radiation, brand of GJ tube, and reason for replacement were recorded. Statistical analysis was performed to determine the outcomes of average length of time between exchanges and average yearly fluoroscopy time.

Results:

A total 143 patients were identified, with a total of 534 GJ changes performed. Of all the cases performed, 331 cases were exchanges and 203 were replacements. The average age was 9 years old with a range of 4 years to 14 years. Each patient underwent a median of 2 procedures. The average length of time between procedures was 140.6 days with an average fluoroscopy time of 1.76 minutes. There was a nearly even distribution of brand of tube used, with 49.7% being G-JET ® and 48.3% being MIC-Key®. 51% of exchanges were due to a tube malfunction, such as clogged tubing or broken disc. (Figure 1)

Outcomes	Patient Level n=143
Age, years (median, IQR)	9 (4, 14)
Sex (male, %)	70 (48.9)
Number of Procedures (median, IQR)	2 (0, 4)
Time Between Change, days	
(median, IQR)	116.3 (66.6, 194.9)
(mean, range)	140.6 (14.1, 448.1)
Flouro Times, min	
(median, IQR)	0.7 (0.3, 2.4)
(mean, range)	1.76 (0.10, 18.9)
Estimate Skin Exposure, mGy	
(median, IQR)	2.75 (0.98, 7.87)
(mean, range)	9.19 (0.18, 155.4)
Dose Area Product, Gycm^2	
(median, IQR)	428 (185, 1393)
(mean, range)	1545 (48.3, 23,476)
Brand Name (n, %)	
G-JET	71 (49.7)
MIC-Key	69 (48.3)
Procedure (n, %)	
Exchange	103 (72.1)
Replacement	51 (35.7)

Table 1: Demographics and Descriptive analysis of Patient Population

Cumulative fluoroscopy time annually was significantly higher if a patient needed a replacement (11.4 minutes) versus an exchange (0.92 minutes), p <0.0001. As would expected with increased fluoroscopy times, the Dose Area Product of radiation was significantly higher if the tube was being replaced, p <0.0001. (Figure 2)

	Exchange N=331	Replacement N=203	Exp (Beta, 95% CI)	p-value
Flouro Time, mins (mean, SD)	0.92 (7.01)	11.4 (97.4)	10.5 (8.75, 12.4)	<0.0001
Dose Area Product, Gycm^2 (mean, SD)	576.4 (1294.26)	4200.8 (5737.0)	6.69 (5.31, 8.41)	<0.0001
Estimated Skin Exposure, mGy (mean, SD)	3.45 (10.4)	25.5 (34.6)	9.77 (8.00, 11.9)	<0.0001

Table 2: Differences between exchange vs. replacement on a case level with adjusting for age, gender, repeated measures, and number of procedures

We also found that the GJET® malfunctioned at a rate of 8.9% due to a valve issue compared to a MIC-Key®, which malfunctioned due to valve issue at 3.3%, p = 0.03. An odds ratio of 3.01was found for a MIC-Key® to be replaced for general malposition/malfunction/leaking, p= 0.009. (Figure 3)

Reason for Change	GJET (N %)	MIC-Key (N %)	OR (95% CI)	p-value
Routine	29 (11.8)	44 (18.2)	1.75 (0.89, 3.48)	0.11
Any Tube	138 (56.1)	125 (51.7)	0.96 (0.59, 1.56)	0.86
Any Balloon	44 (17.9)	17 (7.02)	0.57 (0.26, 1.29)	0.18
Any Valve	22 (8.94)	8 (3.31)	0.30 (0.10, 0.86)	0.03
General Malposition / Malfunction/Leaking	13 (5.28)	48 (19.8)	3.01 (1.30, 6.90)	0.009

Table 3: Generalized Estimating Question assessing the odds of specified reason relative to GJ tube bran adjusting for age, gender, repeated measures, and number of procedures.

Discussion:

Despite the frequency of GJ tube placement/replacement in pediatric medicine, there is a significant lack of literature surrounding the subject. Currently there is an ongoing debate between institutions surrounding the best practices for appropriate GJ tube care. The discussion revolves around the decision to perform GJ tube changes at regularly scheduled intervals or intervene and replace the tubes only when they malfunction.

It is important to state that the timeline for routine changes has been centered around guidelines released by GJ tube manufacturers themselves. The main argument by institutions who favor scheduled changes makes the assumption that the tube is more likely to be in the correct position

and only require an exchange versus a replacement. They then argue that since they are just exchanging the tube their procedure time and radiation dose is lower. Another argument by these institutions is that by scheduling changes they minimize the number of times patients have to go through the emergency department due to it being an off hour, holiday or weekend. The question though remains does 4 exchanges a year still have less radiation dose than 1 or 2 replacements a year? Also, while we did not evaluate the economic impact of this, further study would be warranted. This study is the first to present objective data addressing the empiric data of a single institutions experience not scheduling GJ changes.

We found that on average a pediatric GJ tubes lifespan is approximately 4.7 months, which is a lengthier expectancy than the three-month recommendations published by the manufacturers [7]. However, we found that if the GJ tube requires replacement, there is a significantly increased fluoroscopy time and radiation exposure associated to both the patient and physician with each occurrence. We also found that the MIC-KEY® is more likely to need a replacement versus the G-JET®. This interesting finding be used to argue that G-JET® is a "better" tube from a radiation standpoint.

The importance of family education on the management and maintenance of these tubes cannot be understated. Detailed teaching with families may prevent various complications, including tube malfunction, and should continue with each exchange/replacement for as long as the tube is required.

The limitations to this study include the retrospective nature of the study. In addition, radiation dose exposure, while recorded is inaccurate without additional nonrecorded information such as the patient's height and weight at the time of the procedure, the table height in relation to the II machine, and the use of collimation.

Conclusion:

Current guidelines recommended by the GJ tube manufacturers suggest routine scheduled changes of GJ tubes every three months, however we found that this could be extended to nearly 5 months which greatly decreases the number procedures throughout the year a patient receives. GJ tube replacements result in a significantly higher radiation exposure for the patient compared to exchanges.

Further studies comparing scheduled GJ tube change data is needed to ascertain whether scheduling results in less replacements and more exchanges, which may have implications on patient radiation dose and other risks.

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