E-ISSN: 2616-3470
P-ISSN: 2616-3462

https://www.surgeryscience.com
2024; 8(1): 189-193
Received: 06-01-2023
Accepted: 09-02-2024

Dr. Hetvi N Marsonia
Senior Resident, Department of General Surgery, PDU Civil Hospital, Rajkot, Gujarat, India

Dr. Jignesh P Dave
Associate Professor, Department of General Surgery, PDU Civil Hospital Rajkot, Gujarat, India

Corresponding Author:
Dr. Hetvi N Marsonia
Senior Resident, Department of General Surgery, PDU Civil Hospital, Rajkot, Gujarat, India

Prospective comparative study between stamm's and witzel's method of feeding jejunostomy

Dr. Hetvi N Marsonia and Dr. Jignesh P Dave

DOI: https://doi.org/10.33545/surgery.2024.v8.i1c.1070

Abstract
Introduction: Feeding jejunostomy is surgical operation to create an opening of jejunum through an abdominal incision or endoscopically to establish enteral feeding. Feeding tube is a medical device used to provide nutrition to people who cannot obtain nutrition by mouth, or are unable to swallow safely or need nutritional supplementation. After the introduction of this method in the past, over a period of time many modifications of this method came into view. Here we are mainly concerned with comparing only two methods stamm's and witzel's method out of so many different methods available for feeding jejunostomy.
Aim: To compare effectiveness and complications of stamm's method v/s witzel's method of feeding jejunostomy.
Materials and Methods: It is a type of comparative interventional study design. Total 50 patient's were included in study, out of with 25 underwent for stamm's method and 25 underwent for witzel's method of feeding jejunostomy. Patient's details including personal data, anthropometric data, disease history, various laboratory and radiological investigations, method used for creating feeding jejunostomy and its outcome including various complications occurred during a regular follow up of a patient for 3 months were entered into Microsoft excel sheet and was analysed using SPSS 22 version software. Study was done to Compare and contrast the two methods and final outcome including the complication frequency between the two methods of the feeding jejunostomy.
Results: Both stamm's and witzel's method are equally effective in improving nutritional status of the patient, however complication frequency for both sets were found to be different. Statistically significant association of tube dislodgement was found in respect to the type of method performed which is more common in stamm's as compared to witzel's method. Rest complications rates between two groups are comparable.
Conclusions: Both the methods have similar efficacy in term's of it's usefulness. Most of the complications were found to be related to technical errors except few such as tube dislodgement which is more common in stamm's method. So the technique to which the surgeon is more acquainted with should be used.

Keywords: Feeding jejunostomy, enteral feeding, stamm's method, witzel's method

Introduction
Feeding jejunostomy is surgical operation to create an opening of jejunum through an abdominal incision or endoscopically to establish enteral feeding. Feeding tube is a medical device used to provide nutrition to people who cannot obtain nutrition by mouth, or are unable to swallow safely or need nutritional supplementation. The state of being fed by feeding tube is called enteral feeding or tube feeding. A jejunostomy may be utilized for feeding purposes in malnourished patients, either before or after the major surgical procedures.it is a valuable treatment modality in the management of both acute and chronic malnutrition [1, 2]. From the surgeon's point of view it is a good way of delivering the maximum calories with least procedure related morbidity and mortality. After the introduction of this method in the past, over a period of time many modifications of this method came into view. Here we are mainly concerned with comparing only two methods stamm's and witzel's method out of so many different methods available for feeding jejunostomy [1, 3, 4].

Materials and Methods
It is a type of comparative interventional study design. All the patients undergoing major GI surgeries who can't take orally for the long time including post corrosive dysphagia,

oesophageal carcinoma, pancreatic, biliary and liver resection in the department of general surgery PDU medical college and civil hospital were included in this study. Patients were allotted into two groups prior to surgery- one group underwent feeding jejunostomy by stamm's method and one group underwent feeding jejunostomy by witzel's method. Energy and fluid requirement for jejunostomy feeding was calculated taking into consideration patient's individual need, age and body weight. Feeding was started on Post-operative day^{-1} in most of the patients after the confirmation of presence of bowel sounds. Intravenous crystalloids were reduced proportionally as the enteral feeding was increased and discontinued once the target rate of enteral feeding was achieved. Feeding through the jejunostomy was continued until the patient tolerates oral feed during regular follow – ups. The outcome was defined successful if jejunostomy was used for enteral nutrition after surgery and discontinued when patient achieved adequate oral nutrition or was discharged home on supplementary jejunal feeding.

Patient's details including personal data, anthropometric data, disease history, various laboratory and radiological investigations, method used for creating feeding jejunostomy and its outcome including various complications occurred during a regular follow up of a patient for 3 months were entered in a proforma. Data was entered into Microsoft excel sheet and was analysed using SPSS 22 version software.

The improvement in the nutritional status of the patient was assessed by serial monitoring of the haemoglobin, serum electrolytes (Sodium & potassium), serum protein, serum albumin and weight of the patient in pre-operative period, at one week, at 1 month and at 3 months. And its significance was studied using t-test. The complications occurring during the period of follow up were entered into the proforma. Complications in the study included are leak into peritoneal cavity, tube dislodgement, jejunal perforation, enterocutaneous fistula, abscess-cutaneous/intraabdominal, FJ site intussusception, bowel obstruction/volvulus, tube detachment, skin excoriation, diarrhoea, FJ site wound infection, electrolyte imbalance, constipation, FJ tube block etc. [5]. Patient were followed up for 3 months or till removal of feeding jejunostomy. Study was done to Compare and contrast the two methods and final outcome including the complication frequency between the two methods of the feeding jejunostomy.

Results

The study consists of analysis of 25 cases of stamm and 25 cases of witzel feeding jejunostomy performed at PDU civil hospital Rajkot and comparing them in view of different complications associated with them.

Table 1: Comparison of age distribution among the study subjects with respect to type of method

Age group	Type of Method				Total		p-value #
	Stamm		Witzel				
	N	%	N	%	N	%	
<30 years	7	28.0%	15	60.0%	22	44.0%	0.089
31 to 45 years	7	28.0%	2	8.0%	9	18.0%	
46 to 60 years	7	28.0%	4	16.0%	11	22.0%	
>60 years	4	16.0%	4	16.0%	8	16.0%	

Chi-square test

In the study, majority of the subjects were aged under 30 years in both Group A (28.0%) and Group B (60.0%). Overall, the most common age group was less than 30 years (44.0%), followed by the age group of 46 to 60 years (22.0%). The study did not find significant difference in proportions between the groups with respect to age distribution, thereby eliminating the selection bias.

Table 2: Comparison of gender distribution among the study subjects with respect to intervention

Gender	Type of Method				Total		p-value #
	Stamm		Witzel				
	N	%	N	%	N	%	
Male	17	68.0%	13	52.0%	30	60.0%	0.248
Female	8	32.0%	12	48.0%	20	40.0%	

Chi-square test

In the study, majority of the subjects were males in both stamm's (68.0%) and witzel's (52.0%). Overall, males were observed in majority (60.0%), and the remaining were females (40.0%). The study did not find significant difference in proportions between the groups with respect to gender distribution, thereby eliminating the selection bias.

Table 3: Comparison of co-morbidities among the study subjects with respect to intervention

Co-morbidities		Type of Method				Total		p-value #
		Stamm		Witzel				
		N	%	N	%	N	%	
DM	Present	0	0.0%	0	0.0%	0	0.0%	-
	Absent	25	100.0%	25	100.0%	50	100.0%	
HTN	Present	4	16.0%	5	20.0%	9	18.0%	0.713
	Absent	21	84.0%	20	80.0%	41	82.0%	
IHD	Present	0	0.0%	0	0.0%	0	0.0%	-
	Absent	25	100.0%	25	100.0%	50	100.0%	
CLD	Present	0	0.0%	0	0.0%	0	0.0%	-
	Absent	25	100.0%	25	100.0%	50	100.0%	
CKD	Present	1	4.0%	0	0.0%	1	2.0%	0.312
	Absent	24	96.0%	25	100.0%	49	98.0%	
COPD	Present	0	0.0%	0	0.0%	0	0.0%	-
	Absent	25	100.0%	25	100.0%	50	100.0%	
Others	Present	0	0.0%	0	0.0%	0	0.0%	-
	Absent	25	100.0%	25	100.0%	50	100.0%	

Chi-square test

In the study, the co-morbidities present among the subjects were hypertension (18.0%) and chronic kidney disease (2.0%). None of the subjects in the study were suffering from co-morbidities such as diabetes mellitus, ischemic heart disease, chronic lung

disease, chronic obstructive pulmonary disease and any other disorders. The study did not find significant difference in proportions between the groups with respect to existing co-morbidities, thereby eliminating the selection bias.

Table 4: comparison of different indications for feeding jejunostomy between two groups

Indications	Type of Method				Total	
	Stamm		Witzel			
	N	%	N	%	N	%
Post -corrosive dysphagia	13	52.0%	15	60.0%	28	56.0%
Post cricoid carcinoma	2	8.0%	1	4.0%	3	6.0%
Oesophageal carcinoma	5	20.0%	5	20.0%	10	20.0%
As a additional procedure in major GI surgeries	5	20.0%	4	16.0%	9	18.0%

Table 5: Comparison of complications among the study subjects with respect to intervention

Complications		Type of Method				Total		p-value #
		Stamm		Witzel				
		N	%	N	%	N	%	
Leak into Peritoneal Cavity	Yes	0	0.0%	1	4.0%	1	2.0%	0.312
	No	25	100.0%	24	96.0%	49	98.0%	
Tube Dislodgement	Yes	8	32.0%	0	0.0%	8	16.0%	0.002*
	No	17	68.0%	25	100.0%	42	84.0%	
Jejunal Perforation	Yes	0	0.0%	1	4.0%	1	2.0%	0.312
	No	25	100.0%	24	96.0%	49	98.0%	
Enterocutaneous Fistula	Yes	1	4.0%	0	0.0%	1	2.0%	0.312
	No	24	96.0%	25	100.0%	49	98.0%	
Cutaneous Intra-abdominal Abscess	Yes	0	0.0%	1	4.0%	1	2.0%	0.312
	No	25	100.0%	24	96.0%	49	98.0%	
FJ Site Intussusception	Yes	0	0.0%	1	4.0%	1	2.0%	0.312
	No	25	100.0%	24	96.0%	49	98.0%	
Bowel Obstruction Volvulus	Yes	0	0.0%	0	0.0%	0	0.0%	-
	No	25	100.0%	25	100.0%	50	100.0%	
Tube Detachment	Yes	14	56.0%	8	32.0%	22	44.0%	0.087
	No	11	44.0%	17	68.0%	28	56.0%	
Skin Excoriation	Yes	14	56.0%	12	48.0%	26	52.0%	0.571
	No	11	44.0%	13	52.0%	24	48.0%	
Diarrhoea	Yes	3	12.0%	11	44.0%	14	28.0%	0.012*
	No	22	88.0%	14	56.0%	36	72.0%	
Constipation	Yes	3	12.0%	3	12.0%	6	12.0%	1.000
	No	22	88.0%	22	88.0%	44	88.0%	
Electrolyte Imbalance	Yes	3	12.0%	8	32.0%	11	22.0%	0.088
	No	22	88.0%	17	68.0%	39	78.0%	
FJ Site Wound Infection	Yes	2	8.0%	1	4.0%	3	6.0%	0.552
	No	23	92.0%	24	96.0%	47	94.0%	
FJ Tube Block	Yes	7	28%	5	20%	12	24%	0.507
	No	18	72%	20	80%	38	76%	

Chi-square test

In the study, the presence of complications was observed among the patients subjected to either of the procedures. Accordingly, complications such as tube dislodgement, enterocutaneous fistula, tube detachment, skin excoriation, and site wound infection were more common after Stamm's method of jejunostomy. On the contrary, complications such as leak into peritoneal cavity, jejunal perforation, cutaneous intra-abdominal abscess, site intussusception, diarrhoea, and electrolyte imbalance were more common after Witzel's method of jejunostomy. However, the study found statistically significant association of only tube dislodgement and diarrhoea with respect to the type of method performed.

In Stamm group, 28% had FJ Tube Block and in Witzel group, 40% had FJ Tube Block. There was no significant difference in the incidence of FJ Tube Block between two methods.

However, in our study it was found that re-insertion of feeding tube was more difficult in witzel's group. There was total 7 cases in stamm's group and total 5 cases in witzel's group reported for the feeding tube block. In stamm's group we were able to reintroduce tube without any difficulty but in the witzel's group out of 5 total 2 cases required re-exploration and introduction of feeding tube.

One patient in stamm's group and one patient in witzel's group, both operated in case of post corrosive acid ingestion were died post operatively one on post-operative day 2 and one on post-operative day 3 in case of sudden cardiorespiratory arrest due to multi organ disfunction syndrome. Due to this reason we were not able to study long term complications in both this subjects.

One patient in witzel group operated for post traumatic duodenal perforation developed leakage at retrograde duodenostomy site on post-operative day 12. Patient was again taken for re-exploration where primary closure of leak site was done and patient was kept under ICU care. This patient was expired on post-operative day 3 of re-exploration owing to sudden cardiorespiratory arrest in case of septicemia

Total percentage of mortality among study subjects during the three months of period of follow up was: in stamm's group (4%) and in witzel's group (8%). Overall mortality was (6%).

However, in any of the case mortality was not associated with complications related to procedure of feeding jejunostomy, rather it was associated with complications related to primary disease process. So study did not find any significant difference in proportion between the groups in respect to the mortality.

Discussion

Here we have compared all our data and results with the study done by Paul A. Thodiyil and Jesus A. Tapiya both studies were done for study of complications in T tube jejunostomy and needle catheter jejunostomy respectively as there is no relevant studies done between stamm's and witzel's method in the past.

The results of comparative study between the stamm's and witzel's method shows that witzel's method is equally effective as stamm's method in improving the nutritional status of the patients. nutritional status was studied using the comparative data such as hemoglobin value, serum electrolytes, weight of the patient, serum protein and serum albumin level pre-operatively, at 1 week, at 1 month and at 3 months of follow up. However, it was observed that most of the changes in the electrolytes were observed due to changes in the osmolarity of different feeding formulas.

Patients in both the study groups were comparable in terms of age, gender diagnosis and duration of follow up. There were significantly larger number of males in both the groups. The study did not find significant difference in proportions between the groups with respect to gender distribution, thereby it was eliminated by the selection bias. Majority of the patients included in the study were under the age of 30 years, in stamm's group 28% and in witzel group 60%. Overall, the most common age group was less than 30 years. However, the study did not find significant difference between the two groups with respect to age distribution, thereby eliminating the selection bias.

Most of the operations were emergency operations. 92% of stamm's feeding jejunostomy and 96% of witzel's feeding jejunostomy were performed on emergency bases. However, there was not significant difference in the proportion between the two groups.

The most common indication for feeding jejunostomy was as a procedure to supplement the nutrition in case of dysphagia due to post corrosive acid ingestion and prepare the patient for the definitive surgery by improving the nutritional status of the patient.in stamm's group there were total 13 patients out of 25 (52%) and in witzel's group there were total 15 patients out of 25 (60%), making post corrosive acid ingestion dysphagia the most common indication for performing feeding jejunostomy in both the groups in our study. Second most common indication was as a palliative procedure in case of end stage non-operable esophageal (20%) and laryngeal carcinoma (6%). Third most common indication was as an additional procedure to supplement nutrition during the recovery phase of major operations of gastro intestinal tract including operations of liver, biliary tree and pancreas (18%).

Our main aim in the study was to compare the effectiveness and assess the complication rate between stamm's and witzel's method.

There are some risks associated with feeding through a jejunostomy tube. Here we have studied the frequency of all the listed complications between the two different groups and from the study it was mainly found that most of the complications were either related to the faulty technique in creation of feeding jejunostomy, different technical aspects between the two methods and feeding formula related complications.

Only one patient (Total 2%) in witzel's group showed peritonitis due to leakage from the jejunostomy site. She underwent re-exploration and revision of feeding jejunostomy tube by stamm's method. However previous literature shows that sub-serosal tunnel made in the witzel's method reduces the chances of leakage from the jejunostomy site, here it could be attributed to the faulty technique of creating jejunostomy.in study done by J. tapia for needle catheter jejunostomy this rate was 6.6% [6].

Witzel's method of creating feeding jejunostomy is technically more demanding and more time consuming than stamm's method. It was evident by complication such as fedding jejunostomy site perforation which was seen in only one patient in witzel's group (4%). This could be due to deeper sutures placement while creating the seromuscular tunnel that can lead to inadvertent complication such as jejunostomy site perforation. This patient was managed by re-exploration with primary closure of FJ site jejunal perforation and refashioning of feeding jejunostomy tube.in study done by Paul A. Thodiyil FJ site perforation rate was found to be also in 4% of cases, which is comparable with our study [7]. In our study we found that technique related complications such as FJ site perforation, leak into peritoneal cavity, enterocutaneous fistula were found to be more common in cases where surgery was performed by surgical residents as compared to consultant surgeon.

Tube dislodgement was seen in total 8 patients in stamm's group (32%) and there were no such cases reported in the witzel's group (0%). This result shows that seromuscular tunnel in witzel's method holds the tube in place and prevents its dislodgement. In all the reported cases of dislodgement it was possible to reintroduce foley's catheter no. 18 without any difficulty and the position of the tube was confirmed by ultrasonography after re-introduction. In study done by Paul A. Thodiyiil rate of tube dislodgement was 6%. In keeping with previous studies as shown by Paul A. Thodiyiil, feeding tubes encourages the early formation of a fibrous tract permitting safe replacement in the event of tube dislodgement [7].

Rate of tube detachment was slightly higher in the stamm's group (56%) as compared to witzel's group (44%) however it was statically not insignificant. Most of the incidents of tube detachment was related to local complications such as wound infection and skin excoriation surrounding the feeding tube. All the cases were managed by improving local hygiene, preventing soakage of dressing with feeding formulas, and managing local skin excoriation using antiseptic solutions and antibiotics.

FJ tube block was seen in 40% patients of stamm's group and 28% patients of witzel's group. In study done by Paul A. Thodiyiil rate of FJ tube block was 12%. Out of the 7 cases in stamm's group none of the patients required surgical intervention and were managed successfully by flushing the catheter with water or sodium bicarbonate solution. Out of blocked FJ tube only two foley's catheter had to be changed and it was possible to reinsert a new 18 Fr foley's catheter without the need for fluoroscopic guidance. In witzel's group total 5 cases were reported for FJ block out of 3 cases were managed conservatively and only 2 cases required surgical intervention to change the FJ tube as we were not able to reinsert the foley's catheter in these two cases.

Diarrhea was seen in 12% cases of stamm's group and 44% cases of witzel group and overall, it was seen in 28% of study cases. In study done by the Paul A. Thodiyil it was seen in 36% of study cases [7]. Diarrhea related to the feeds were managed by change of the feeding regimen, decrease in the strength of feeds or change of infusion rate.

Constipation was seen in 12% cases of both the study groups. Constipation related to the feeds was managed by improving the

hydration status of the patient and modifying the feeding formula.

Both diarrhea and constipation were related to the feeding formula composition related rather than the technical differences between two methods.

During the period of study only one patient in witzel group (4%) developed feeding jejunostomy tube site intussusception. After confirming the diagnosis by contrast CT scan of abdomen this patient was taken for emergency surgery and intussusception was relived and refashioning of FJ was done intra-operative photographs is given in the image below (Figure-1). Previously study done by U.M. Hughes in total 251 patients shows that there were total 40 cases (16%) of feeding tube site intussusception. However, studies done in past shows that in witzel's type of jejunostomy there is less chances of intussusception compared to stamm's method in owing to few technical differences between the two methods. In witzel's method 4-5 cm length of jejunum is fixed to underlying peritoneum instead of single point fixation in stamm's method which prevents FJ site intussusception. Here we could not assess the statistical correlation between method of feeding jejunostomy used and FJ site intussusception. As it is rare complication it requires study in large sample size.

Fig 1: Intra-operative image suggestive of FJ site intussusception

Conclusion

From this study it can be concluded that Both stamm's and witzel's methods are equally effective in improving the nutritional status of the patient. The complication rates between two groups are comparable. Stamm's method is a technically less demanding and quick procedure as compared to the witzel's feeding jejunostomy method. Techniques related complications such as FJ site perforation, leak into peritoneal cavity, FJ site intussusception, bowel obstruction, necrosis of the bowel wall is more frequently associated with the witzel's method however, in our study there were small numbers of subjects and we could not study the significant association of witzel's method with all these complications in compared to stamm's method. To comment on this matter study on a larger scale is required. Complications such as tube dislodgement, tube detachment, skin excoriation, FJ site wound infection and enterocutaneous fistula were more commonly associated with the stamm's method. However statistically significant association of only tube dislodgement was found in respect to the type of method performed which is more common in stamm's method as compared to witzel's method.

Conflict of Interest
Not available

Financial Support
Not available

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How to Cite This Article
Marsonia HN, Dave JP. Prospective comparative study between Stamm's and Witzel's method of feeding jejunostomy. International Journal of Surgery Science. 2024;8(1):189-193.