

EFFECT OF TRUNCAL VAGOTOMY ON MOTOR FUNCTION OF GALLBLADDER-A PROSPECTIVE ANALYSIS

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ABSTRACT

A prospective clinical study on choleakinesia following total vagotomy (Bilateral truncal vagotomy) was carried out during the period from April 2010 to December 2016. Total 55 cases were studied who were suffering from chronic duodenal ulcer. Out of these total 55 cases fifteen cases had gastric outlet obstruction with hugely dilated stomach which was considered as control group in this study. Other 40 cases were considered as study group. Truncal vagotomy with retrocolic isoperistaltic GJA done in study group and only retrocolic isoperistaltic GJA operation done in control group. Two patients had incomplete vagotomy. All the patients were male and average age was 38.1 years. 32.7% cases were belonging to the age group between 26-35 years which was the highest. Though the cases were operated till September 2016, they were followed up till December 2016. Gastric acidity, oral cholecystography and ultrasonography of upper abdomen was done in both pre and post operative period. All cases were meticulously examined to exclude other associated pathology. Cases were diagnosed by Barium meal and clinical analysis. 14 days post-operatively gastric acid analysis and three months post-operatively oral cholecystography was done. In the post-operative follow up period ultrasonography upper abdomen was done. 39 (71%) patients were turned up for check up in post-operative period out of which 29 patients belong to complete vagotomy group. In conclusion it was seen that following total vagotomy the contraction of gall bladder was definitely reduced with decrease % loss of bile results stasis of bile. There was more than double dilatation of the gall bladder.^[1,4] as detected three months post-operatively after complete section of vagus. 7.5% of patients of complete vagotomy group developed gall stones till three to four years post-operatively.^[1] and 20% patients developed minimal gall bladder sludge and 5% patients developed dense peripheral sludge with wall thickening till that period. Incomplete vagotomy and control group didn't show such significant changes. More than 50% acidity was reduced following truncal vagotomy in fasting, basal and maximum acid output in both free and total state.

KEYWORDS: Choleakinesia, Vagotomy, Truncal Vagotomy, Stasis of bile, Motor function, Dilatation of gallbladder, Gallstones, Gastric acidity, Vagus nerve.

INTRODUCTION

Vagus is a mixed type of cranial nerve which is parasympathetic to stomach and gall bladder. Vagus is a secretomotor to stomach (gastrium). Hyperacidity is one of the most important factors to cause duodenal ulcer. Fig 1 It is responsible to maintain the cephalic phase of gastric secretion. Total parasympathetic denervation is said to be the accepted operation to treat duodenal ulcer. The motor activity of the gallbladder is grossly affected after vagotomy (Truncal vagotomy), which is the most common operative procedure to cure chronic duodenal ulcer. Truncal vagotomy with GJA (Drainage operation) is most commonly performed operation in chronic peptic ulcer.^[2] The vagus nerve is a parasympathetic nerve supplying stomach and gall bladder is also a secreto-

motor nerve to stomach and gall bladder. Its complete transection causes severe motor loss to the gall bladder results akinesia leading to dilatation of the gall bladder and stasis of bile. It results sludge and gall stones formation.^[3,4] by a process of biochemical denaturation though contractile activity to the gall bladder is also supported by hormone cholecystokinin. Total vagotomy reduces gastric acidity and enhances blood flow towards the ulcer results rapid healing.^[5]

MATERIALS AND METHODS

This study conducted in 55 male patients of chronic duodenal ulcer.^[5,6] during April 2010 to December 2016. In the study 15 patients had gastric outlet obstruction with hugely dilated stomach Fig.2 that was taken as

control. These patients underwent retrocolic isoperistaltic gastrojejunal anastomosis (GJA). The uncomplicated 40 patients who were belonging to study group underwent truncal vagotomy with retrocolic isoperistaltic gastrojejunostomy. Till September 2016 the patients were operated after which the period was considered post-operative follow up period. Patients were followed up till December 2016.

Oral cholecystography (OCG) was done in both pre and 3 months post-operative period to know the function and capacity of the gall bladder. Ultrasonography upper abdomen was done in both pre and post-operative follow up period. Thorough clinical examination was done. Fig 5 Barium meal X-ray was done to diagnose the disease.

Hollander Insulin test (1948) was done.^[7] pre and 14 days post-operative period to find out volume of gastric juice and gastric acidity in Resting, Basal and Maximum acid output in both Free and Total state. Fig 3, 4

The volume of the gall bladder was calculated from a chart paper by Siffert.D.S (1949) based on a method described by Boyden, 1926.^[8,9,10]

Per-operative examination of all viscera was done to confirm the diagnosis.

RESULTS AND OBSERVATIONS

A total 55 male patients of chronic duodenal ulcer were studied during April 2010 to December 2016. Till September 2016 cases were operated. The patients were grouped in the following manner-

Group A- Fifteen patients who had gastric outlet obstruction with hugely dilated stomach subjected for gastrojejunal anastomosis (GJA) Fig 5, 6. They were taken as control in this study.

Group B- Another forty patients with chronic uncomplicated duodenal ulcer were treated with total truncal vagotomy with retrocolic isoperistaltic gastrojejunostomy Fig 7, 8, 9, 10. This was taken as study group.

All the patients were male with average age 38.1 years. Youngest being 20 years and eldest being 68 years. In group A- The average age was 37 years, the youngest being 22 years and the eldest being 57 years.

In group B- The average age was 38.4 years, the youngest being 20 years and the eldest being 68 years.

The patients were grouped according to different age brackets. It is seen that the incidence was highest between 26-35 years with 18 cases. Next was the 36-45 years with 16 cases.

Pre-operative gastric acidity by Hollander insulin gastric secretion test (1948) was done^[7] in all the patients and this revealed that the average acidity in all the 55 cases

were as follows:

Resting- 2.9 m Eq with a volume of 139.1 ml. Basal- 2.8 m Eq with a volume of 53.8 ml.

Maximum acid output (MAO)- 24.2 m Eq with a volume of 133.8 ml. The average post-operative acidity in all the 55 cases were as- Resting- 2.0 m Eq (Vol-186.7ml).

Basal- 1.8 m Eq (Vol-35.3 ml). M.A.O- 19.2 m Eq (Vol-100.2 ml).

The average pre and post-operative acidity (In m Eq/L/hr) in different groups as-

(A) Pre-operative

GJA- Resting: 2.6 (Vol-138.1ml). Basal: 3.1 (Vol-62.4 ml).

MAO: 23.3 (Vol-161.6).

TV+GJA (Complete) - Resting: 3.0 (Vol-122.2 ml). Basal: 3.2 (Vol-44.0 ml).

MAO: 24.9 (Vol-131.0 ml).

TV+GJA (Incomplete)- Resting: 3.1 (Vol-157.0). Basal: 2.3 (Vol-58.0).

MAO: 24.5 (Vol-109.0).

(B) Post-operative

GJA-Resting: 2.1 (Vol-118.7ml). Basal: 2.5 (Vol-46.3 ml).

MAO: 23.2 (Vol-128.3ml).

TV+GJA (Complete) - Resting: 1.4 (82.3 ml). Basal: 1.4 (82.1 ml).

MAO: 1.4 (Vol-82.1 ml).

TV+GJA (Incomplete) - Resting: 2.4 (Vol-119 ml). Basal: 1.6 (Vol-25.0 ml).

MAO: 22.9 (Vol-82.5 ml).

In the study group out of 40 patients 2 patients had incomplete vagotomy. Completeness was determined by post-operative Hollander test which revealed elevation of acid secretion over 20 mEq/hour of basal level.

Oral cholecystography (OCG-Graham cole test) was done in pre Fig 11, 13, 15, 17 and post-operative period Fig 12, 14, 16, 18. The average volume and rate of emptying of gall bladder of different groups of patients were as.

(A) Pre-operative

GJA: Volume at tonus- 24.6 ml.

Vol one hour after fatty meal- 15.3 ml.

% loss- 41.1 ml.

TV+GJA: Vol at tonus- 25.8 ml.

Vol one hour after fatty meal- 14.6 ml.

% loss- 42.7 ml.

TV+GJA (Incomplete) Vol at tonus- 23.9 ml.

Vol one hour after fatty meal- 15.9 ml.

% loss- 33.4 ml.

(B) Post-operative

GJA: Vol at tonus- 25.3 ml.

Vol one hour after fatty meal- 15.3 ml.

% loss-39.6 ml.

TV+GJA: Vol at tonus-61.4 ml. Vol one hour after fatty meal-15.3 ml.

% loss-25.3 ml. TV+GJA (Incomplete)- Volume at tonus-24.3 ml.

% loss-32.3 ml.

Volume one hour after fatty meal-16.4 ml

Post-operative fasting volume in complete vagotomy cases increased with gross retardation of rate of emptying indicates contractile action of the gall bladder is definitely decreased after total vagotomy which was

evident by after fatty meal ingestion and X-ray examination.^[10] 25.3 % loss of bile was seen in complete vagotomy group where as 39.6 % and 32.3% of loss of bile was seen in gastrojejunostomy and incomplete vagotomy group respectively after fatty meal X-ray.

Post-operatively 39 patients were came for follow up out of which 29 patients had complete vagotomy.9 patients belong to GJA group and 1 patient of incomplete vagotomy group.3 (7.5%) patients out of 39 developed multiple gall stones.^[10,11] within three and half to four years post-operatively.8 (20%) patients developed minimal sludge and 2 (5%) patients had peripheral luminal dense sludge with wall thickening .The hepato-biliary status remained normal in gastrojejunostomy and incomplete vagotomy group.

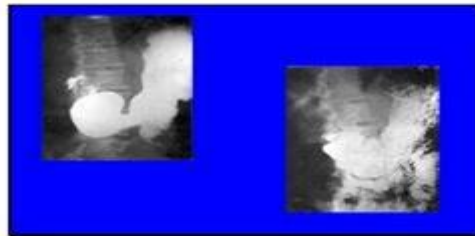


Fig. 1: Barium Meal- DU

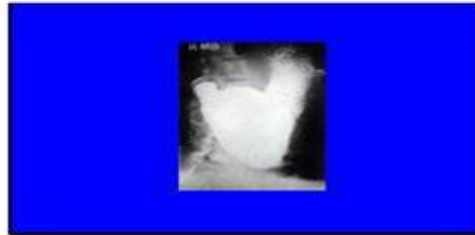


Fig. 2: Ba Meal- Dilated Stomach



**Fig.3: GU+ DU on Ryles tube
Acid estimation**



**Fig. 4: LABORATORY for Titration to
Estimate acidity & US showing GS**



Fig. 5: Visible Peristalsis and DU



Fig. 6: DU & dilated stomach



Fig. 7: Anterior Vagus

STEPS OF OPERATION:



Fig. 8: POSTERIOR VAGUS



Fig. 9: Gja in progress



Fig.10: Gja complete

OCG:

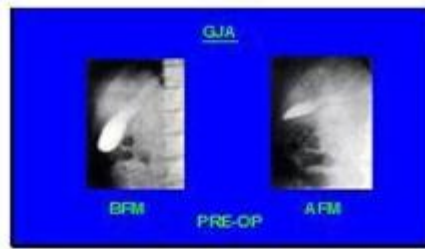


Fig.11

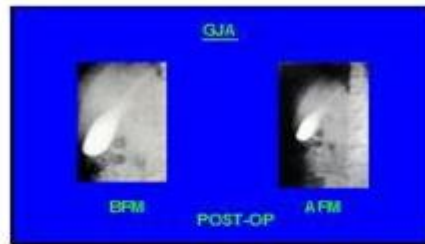


Fig. 12

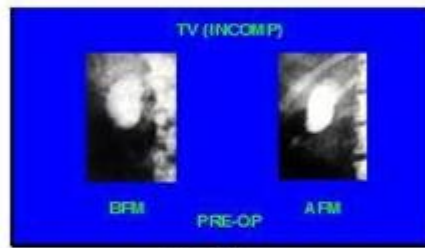


Fig.13

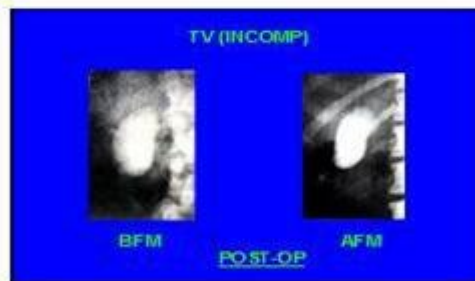


Fig. 14

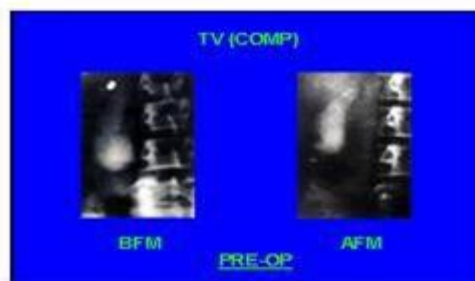


Fig. 15

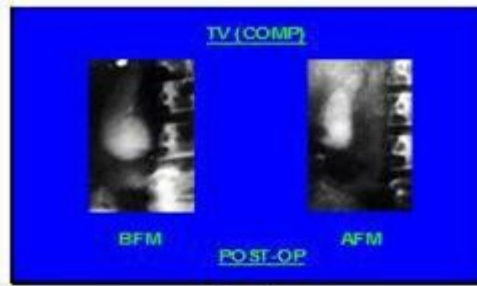


Fig. 16

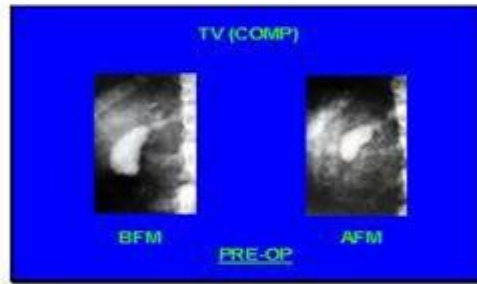


Fig.17

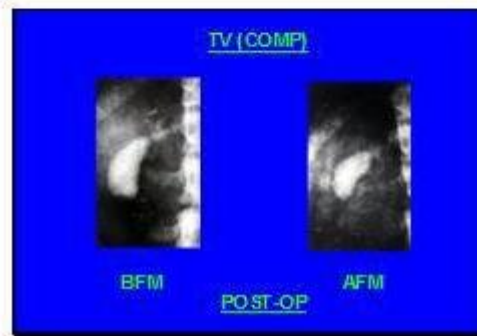


Fig.18

DISCUSSION

This study is an endeavor to evaluate the effect of truncal vagotomy on the motor function of gall bladder. This operation is the operation of choice which is being adopted to treat chronic duodenal ulcer world wide.

A series of 55 patients of long standing chronic duodenal ulcer were taken at random for this study during the period from April 2010 to December 2016 though the operation were executed till September 2016.

In mammals, it has long been recognized that vesicular bile is expelled by contraction of gall bladder musculature. Under the influence of hormone cholecystokinin and vagus the contraction of gall bladder is maintained. Key et al (1993) highlighted that section of the right vagus in cat and to a lesser extent left vagus markedly delay the evacuation of a gall bladder. They noticed that the dilatation of the gall bladder was increasing within 3-6 months post-operatively in experimental laboratory. Ivy (1947) stated that contractile element of the gall bladder is controlled by humoral and nervous mechanism and as such resultant

functional disability following vagotomy is not much considered though can't totally discard. Reviewing literature Mc.Collin (1987) pointed out,^[9] that 2-15% gallstone and upto 22% biliary sludge is possible in post vagectomy gallbladder within 3-10 years post-operative period. However he clearly depicted in favour of other co-factors in this pathogenesis. Sugiyama et al (1995) said that total vagotomy is no doubt to facilitate ulcer healing by reducing gastric acidity and by enhancing flow of circulation towards ulcer.^[10,11] but it causes the biliary channel become akinesia,^[12] and prolong the time of expulsion of bile from the gallbladder.^[13] Sakai et al (1996) highlighted that there is definite chemical dearrengement, dissociation, supersaturation and crystallization following transaction of vagus. In their extensive chemical analysis they pointed out that gallbladder become partially akinetic following total vagotomy.^[14] which is chemically unstable may be considered one of the most important co-factor in the genesis of gallstone formation. The chemical instability may be pathogenic after two years of operation.

In each patient of this series Hollander criteria and oral cholecystography was performed in both pre and post-operative phases. Resting, basal and maximum acid output after insulin was recorded. Post-operatively the acidity test was performed in all the cases on the 14th day of operation to assess the secretory status and completeness of vagotomy. After complete vagotomy there is gross reduction of acidity which had been proved in the study. It was 56.3% in complete group which is in confirmation with the findings of Bank *et al* (1987) who found an incidence of 60% reduction after complete vagotomy. 60-80% reduction is depicted in different series (Robinson. J 1982).^[12]

All the patients were advised to come for check up after three months of operation and periodically as advised. 71% patients came for check up and followed proper advice till the end of the study. All of them were advised to come prepare after three months of operation for oral cholecystography. Johnson and Boyden (1952) studied the effect of double vagotomy on motor activity of human gallbladder.^[10] They found increase fasting volume and decrease rate of emptying of gallbladder after complete vagotomy. This findings was also consistent with the findings of Rudick and Hutchinson (1964). Robinson *et al* (1991) said bile stasis is eventually takes place after bilateral vagotomy.^[11] and established the findings of Johnson and Boyden (1952) who had proved out of 13 patients two patients developed gall stones in 22 and 16.5 months after operation.

Truncal vagotomy with gastrojejunostomy is probably the most commonly performed operation for duodenal ulcer. The safety of the operation with its minimal side effects and easier to perform makes it the rational methods of treatment of duodenal ulcer. Mortality is low (Braasch *et al*, 1970) and acid reduction is much higher. Most of the recurrence is due to incomplete vagotomy.

CONCLUSIONS

- The fasting volume of the gallbladder was approximately double following complete truncal vagotomy.
 - The rate of emptying of the gallbladder was reduced after truncal vagotomy.
 - Contraction of gallbladder was diminished following truncal vagotomy.
 - Acidity was reduced by more than 50% after total vagotomy.
 - Gall stones and sludge formation in the gallbladder was evident after three years of operation of total vagotomy in this study.
 - Incomplete vagotomy with gastrojejunostomy operation had no effect on motor function of gallbladder.
 - Incomplete vagotomy showed the rise of acidity of more than 20 m EQ/hr of the basal level on the 14th day of operation.
- Gastrojejunostomy operation does not have any effect on motor function of gallbladder.
 - Akinesia of the gallbladder is to be seriously considered after total vagectomy operation.

REFERENCES

1. Burge *et al* Post effect analysis of different vagotomy, —In *after Vagotomy*, 1969; 215-242.
2. Bachier. I.A.D Peptic ulcer and its surgical treatment in UK, *Lancet*, 1971; 1: 711.
3. Bank *et al* Biochemical changes of bile after truncal vagotomy, *Gastroenterology*, 1987; 572-587: 39.
4. Boyden. C A study of motor activity of gallbladder after vagotomy, *Surgery*, 1952; 42-43: 2.
5. Braasch *et al* Peptic ulcer and surgical management, *Surg. Cli. N. Am.*, 1970; 72(2): 619-635.
6. Courvoisier. L.G (1961): *Diseases of stomach and duodenum*, cited by Maingot, 1883; 180.
7. Ivy. J, Ian. R Laboratory procedure in a study of total vagotomy, *Gastroenterol*, 1947; 245-251: 347.
8. Key *et al* Gallstone formation, *Surgery*, 1993; 987-989: 542.
9. Mc Collin. J Clinical and biochemical evidence of increased gallstone formation after complete vagotomy, *Gut*, 1987; 1025-1027: 239.
10. Rudick .K. Hutchinson Post vagotomy effect, —In *After Vagotomy*, 1964; 51.
11. Robinson *et al* Bile stasis — a co-factor for gallstone formation, *Dig. Dis. Sci.*, 1991; 35(9): 1025.
12. Robinson. J Aetiology of gall stone formation—a clinical study, *Am. J. Dig. Sci.*, 1982; 506: 9.
13. Sugiyama *et al* (1995): Choleakinesia is a co-factor for gall stone formation, *Nippon. Geka. Gakkai. Zashi*, 1992; 781: 93(7).
14. Sakai *et al* Choleakinesia following Vagectomy —a prospective study in Tokyo, *Nippon. Shokakiby. Gakai. Zashi*, 1990; 2473: 87 (11).