

Improvement In The Technique Of Heller's Myotomy For Achalasia Of The Esophagus By Using Per-operative Dilator

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ABSTRACT

Background: Idiopathic achalasia is the commonest specific primary esophageal motility disorder with defective lower esophageal sphincter (LES) relaxation. Surgical therapy shows the best long-term results, particularly in young patients. The objective of this study is to assess the benefit of using per-operative esophageal Keymed Dilator to check the adequacy of Heller's cardiomyotomy. **Methods:** This is a retrospective comparative study between the standard esophageal cardiomyotomy and cardiomyotomy aided by esophageal dilator. One hundred and fifty seven patients were diagnosed to have achalasia based on clinical, radiological and endoscopic criteria during the period 1968 to 2004. Abdominal Heller's cardiomyotomy with/without anti-reflux procedure was performed for 154 cases and after excluding 14 patients who were lost from follow-up, the remaining 140 were divided into group A (84 patients) who underwent traditional esophageal cardiomyotomy; and group B (56 patients) who underwent esophageal cardiomyotomy during which a flexible esophageal dilator (Keymed Dilator) was used to assess the adequacy of myotomy. Comparison between both groups was made based on fisher exact probability test which is significant when p value < 0.05 . **Results:** Seventy nine patients were males and 78 were females with mean age of 34.14 years (ranging from 7 months to 70 years). Dysphagia, weight loss and regurgitation were the main presenting symptoms; 52% of cases had moderate degree of proximal esophageal dilatation on esophagram; while 40% had severe and 8% had mild degree of dilatation. From the total number of cases, excellent results after Heller's cardiomyotomy were achieved in 75% of cases, satisfactory in 20.7% while poor outcome was seen in 3.57% of cases. But when comparison is made between the two groups (A & B); group B (Key-med Dilator used) had significantly higher incidence of excellent outcome (87.5%) compared to (67.5%) for group A, and the results were not affected by patients' age, duration of illness or the degree of esophageal dilatation. **Conclusion:** Abdominal Heller's cardiomyotomy is effective and safe treatment for achalasia and using per-operative esophageal dilator is a simple and effective method to check for the adequacy of myotomy incision resulting in improved outcome of Heller's cardiomyotomy.

Key Words: achalasia, Heller's cardiomyotomy, esophageal dilator.

Abbreviations: LES (Lower esophageal sphincter); G.I.(Gastro-intestinal); HM(Heller's cardiomyotomy); GERD (Gastro-esophageal reflux disease).

Introduction:

Idiopathic achalasia is the commonest specific primary esophageal motility disorder. The term achalasia is a Greek word means "failure to relax". The etiology and pathogenesis of the disease remain unknown. The commonest neuro-anatomical change seen is a decrease or degeneration of myenteric ganglion cells with some neural fibrosis and variable degrees of chronic inflammation within the myenteric plexus.^(1,2,3,4) Loss of propulsive peristaltic contractions and defective lower esophageal sphincter (LES) relaxation result in stasis of food in the esophagus which progressively dilates and lengthens and thereby assumes a sigmoid shape in advanced cases.⁽⁵⁾ The mucosa of the esophagus often shows esophagitis with mucosal ulceration.

Autopsy studies reveal that patients with achalasia have a thicker esophageal muscle compared with that in normal subjects and using high frequency intra-luminal ultrasound imaging, it is found that LES and esophageal muscle thickness as well as esophageal muscle cross sectional area are greatest in achalasia than other esophageal motility disorders.^(4, 6, 7, 8) Currently there is no treatment that restores esophageal peristalsis and normalizes LES relaxation. Therefore, the existing treatments for achalasia focus on reducing the pressure gradient across the LES, thereby improving gravitational esophageal emptying.

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The available treatments for achalasia are pneumatic dilatation, surgical cardiomyotomy and endoscopic injection of botulinum toxin. Some benefit may be derived from the administration of long acting nitrates and calcium channel blockers with initial response ranging from 50% to 70%.^(1, 2, 3, 5) Surgical therapy shows the best long-term results, particularly in young patients. Heller introduced esophageal myotomy in 1914 by division of the muscle fibers of the distal esophagus with an anterior and posterior incisions through abdominal approach (Double Myotomy), this technique later modified by Groeneveldt and then Zaajier to single anterior myotomy.^(9, 10, 11, 12) There is actually no agreement about the length of myotomy in either its proximal or distal extent and there is no agreement whether an anti-reflux procedure should be added or not and more controversy what anti-reflux procedure to perform.^(13,14)

The most common cause for imperfect late results was failure to relieve completely the obstruction.⁽⁷⁾

There are three approaches to estimate when the myotomy has been completed: (1) Visual inspection of the esophagus and cardia during the performance of cardiomyotomy while the esophageal lumen is distended with a large dilator. (2)

The second approach is the use of intra-operative manometry which is often cumbersome and may be unreliable. (3) The use of intra-operative endoscopy to determine whether there is residual constriction of the channel between the esophagus and the stomach.^(7,15,16)

Aim of the study:

The objective of this study is to evaluate using per-operative esophageal Key-med dilator to check for adequacy of abdominal Heller's cardiomyotomy for achalasia of the esophagus.

Patients and methods

This is a retrospective study representing a clinical experience of Professor Zuhair R. Al-Bahrani at the Medical City and Al-Mustansiria Private Hospital during the period from 1968 to 2004. The study includes 157 patients who were diagnosed to have achalasia of the esophagus based on clinical presentation, and approved by barium swallow and esophagoscopy. The severity of achalasia was divided into three groups according to the radiological appearance:

Severity I: mild degree of esophageal dilatation with tapering distal end, the whole esophagus appears dilated (figure-1(a)).

Severity II: moderate degree of dilatation which is more prominent at the lower end of the esophagus (figure-1,(b)).

Severity III: severe dilatation of the esophagus with elongation and "Sigmoid-shape" (figure-1(c)).

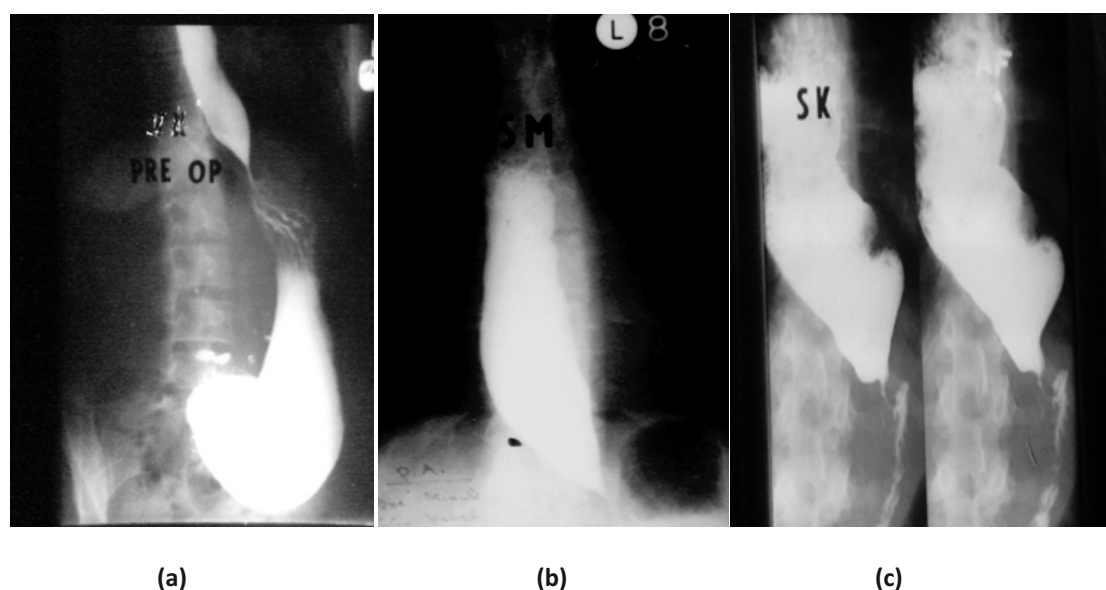


Figure 1:

(a) Mild degree of achalasia, (b) Moderate degree of achalasia, (c) Severe degree of achalasia.

After excluding three patients (two cases treated by endoscopic dilatation, one of them developed leak and underwent open drainage; and the third case was referred with recurrent dysphagia after previous surgery at another hospital), 154 patients underwent abdominal Heller's myotomy alone or with anti-reflux procedure. Fourteen patients were lost from follow-up and the remaining 140 patients were divided into two groups; group (A) includes 84 patients who underwent Heller's myotomy during the period 1968 to the end of 1989 when no intra-operative esophageal dilator was used; while 56 patients in the group (B) underwent Heller's myotomy from 1990 till the end of the study, and during the procedure a flexible "Key-med" dilator shown in figure-2 was used to assess the adequacy of esophageal muscle division. Comparison then was made between the two groups regarding the outcome of esophageal myotomy and statistical analysis was based on Fisher exact probability test which is significant if p value < 0.05 .

The dilator is available in three sizes (9, 14, and 18 mm) and it is introduced by the anesthetist starting by the smaller one, so that in every case when the dilator is used; it can help the surgeon to identify any missing uncut muscle fibers causing the problem of achalasia and therefore the myotomy incision can be extended not only proximally and distally below the gastro-esophageal junction, but also in the depth of myotomy incision when the muscle fibers were stretched by the dilator.

The outcome of Heller's cardiomyotomy was assessed subjectively and objectively depending on clinical, radiological and sometimes endoscopic grounds and they were classified into three groups: Excellent results: when the patient is completely free from dysphagia, regurgitation, or chest pain, he/she is gaining weight and has good quality of life; with good unhindered barium flow to the stomach. Satisfactory results: when the patient suffers from occasional dysphagia, regurgitation or chest pain and the barium study showed some holdup in the esophagus. Poor results: when the symptoms persist necessitating another therapeutic intervention.

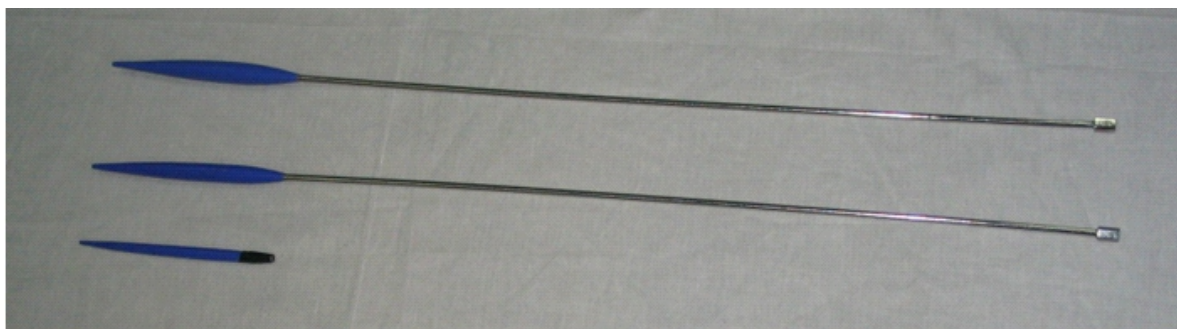


Figure 2: The flexible Key-med dilator available in three sizes (9, 14, and 18 mm).

Results:

During the period from 1968 to 2004, 157 patients with achalasia of the esophagus were reviewed. They were 79 males and 78 females. The patients had mean age of 34.14 years with a range between 7 months to 70 years. Dysphagia, weight loss and regurgitation were the main presenting symptoms. According to the severity of esophageal dilatation seen in barium study, eight percent had grade I achalasia, while 52% and 40% had grade II and II respectively.

The overall subjective and objective results of Heller's cardiomyotomy are shown in table-1. Satisfactory to excellent results were achieved in 96.4 % of the cases; 14 patients (9%) were lost from follow-up and the remaining were followed for a mean of 54.34 months, ranging from 2 months to 30 years.

| OVERALL RESULTS | NUMBER | % |
|-----------------|--------|------|
| Excellent | 106 | 75.7 |
| Satisfactory | 29 | 20.7 |
| Poor | 5 | 3.57 |
| Total | 140 | 100 |

Table-1: Results of Heller's cardiomyotomy.

Use of per-operative Key-med dilator

The patients who underwent surgery were divided into group A in which the dilator was not used, and group B in which the dilator was used during surgery; table-2 shows the characteristics of both groups.

[illegible]

^{*} (Chi-square test, not significant)

Table-2: Criteria of group A and B patients.

When comparison is made between these groups, there appears to be a significant higher incidence of excellent results in group B (87.5%) than group A (67.5%); Fisher exact probability test, $p < 0.005$ (table-3 and 4).

However, the rate of poor results is low in both groups (4.76% and 1.78% respectively); and within the same group, there is no significant difference in outcome among mild, moderate and severe achalasia (chi-square test; $p > 0.5$ for group A; $P > 0.4$ for group B).

| ACHALASIA | | | | | | | |
|-----------|----|----|------|----|------|---|-----|
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| H | Đ | Ç | ĐĐĐĐ | Č | ČČČČ | Ć | Ć |
| HH | ČČ | ČČ | ĐČĐ | ČČ | ČČĐ | Č | ČČĐ |
| HHH | ČĐ | ČČ | ĐČČČ | ČČ | ČČĐĐ | Č | ĐČČ |
| İ ÖPÖ | ĐÇ | ĐĐ | ĐĐĐĐ | ČČ | ČĐČĐ | Ç | ÇĐĐ |

Table-3: Outcome of HM in group A (Dilator not used).

| SEVERITY OF ACHALASIA | TOTAL | EXCELLENT | | SATISFACTORY | | POOR | |
|-----------------------|-------|-----------|------|--------------|-------|--------|------|
| | | Number | % | Number | % | Number | % |
| I | 4 | 4 | 100 | 0 | 0 | 0 | 0 |
| II | 30 | 27 | 90 | 3 | 10 | 0 | 0 |
| III | 22 | 18 | 81.8 | 3 | 13.63 | 1 | 4.5 |
| Total | 56 | 49 | 87.5 | 6 | 10.7 | 1 | 1.78 |

Table-4: Outcome of HM in group B (Dilator used).

endoscopy was then performed to determine whether there was residual constriction of the channel between the esophagus and the stomach. In his work, there were obvious constricting elements distal to the gastro-esophageal junction in 90% of patients that required extension of myotomy onto the stomach for an average of 15 mm. All but one had improved swallowing postoperatively; 8 patients required 'stretch' of the distal esophagus/cardia within the first year postoperatively and one patient was re-operated for fibrous scar obstructing the distal esophagus⁽⁷⁾. Lovecek M. and Grya A. evaluated the completeness of myotomy in 4 patients by using stationary pull-through four-channel preoperative manometry which demonstrated the decreased tonus of LES (the mean 42.06 mmHg before; and then 20.03 mmHg after myotomia). In one case, the finding resulted in necessary extension of the myotomia⁽¹⁵⁾.

Conclusion:

Abdominal Heller's cardiomyotomy is effective and safe treatment for achalasia and using per-operative esophageal dilator is a simple and effective method to check for adequate myotomy incision resulting in improved outcome of Heller's cardiomyotomy; & further study to evaluate the effectiveness of this technique during laparoscopic Heller's cardiomyotomy is recommended.

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Discussion:

There is no cure for achalasia and the goal of treatment should be relief of patient symptoms and improved esophageal emptying. A large number of series have showed that the late results of esophageal cardiomyotomy, whether performed through abdominal or thoracic approach, were significantly better. Generally abdominal HM was proved to be effective in

treating achalasia on the long term as about 96% of our cases had good to excellent results. The criteria for successful treatment were based on subjective parameters by disappearance of symptoms and objective parameters by postoperative barium swallow and esophagoscope. Table-5 illustrates some of the reported success rate of HM.^(17,18,19,20)

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|------------------------------------|---|--|
| Ghassani NB (2000) ⁽¹⁷⁾ | thoracic modified Heller's esophago-cardiomyotomy | 5.22% (good results) |
| EÖÖPÖÖ Ĳ ÖÖÖÖÖ (19) | ĲÖÖÖÖÖÖÖÖ ĲÖÖÖÖÖÖÖÖÖÖÖÖ | ÖÖÖÖÖÖÖÖÖÖÖÖÖÖÖÖ |
| GÖÖÖÖ (2004) ⁽¹⁹⁾ | ÖÖÖÖÖÖÖÖÖÖ ĲÖÖÖÖÖÖÖÖÖÖÖÖ | ÖÖÖÖÖÖÖÖÖÖÖÖÖÖÖÖ |
| FÖÖÖÖÖÖÖÖÖÖ ÖÖÖÖÖ (20) | ĲÖÖÖÖÖÖÖÖ | ÖÖÖÖÖÖÖÖÖÖÖÖÖÖÖÖ (intervention required) |
| ĲÖÖÖÖÖÖÖ | ÖÖÖÖÖÖÖÖÖÖ | ÖÖÖÖÖÖÖÖÖÖÖÖÖÖÖÖ results) |

Table-5: Studies showing the results of HM.

The advantages of abdominal approach for HM include a more effective myotomy because the gastric portion of myotomy can be performed quite easily and the ease of performing a concomitant anti-reflux procedure.⁽⁷⁾

Per-operative use of esophageal dilator

The most important aspect in surgical treatment of achalasia is to divide all the constricting non-relaxing muscular elements that obstruct the gastro-esophageal junction. In the inner coat of the stenotic segment, there are two different muscle bundles: at the lesser curve, the short semi-circular muscle fibers ('clasp') and at the greater curvature the short and long oblique muscle fibers.⁽²¹⁾

It is necessary to always perform a complete myotomy by dissection of the sling fibers of the stomach for at least 2-3 cm on the anterior gastric wall in order to significantly reduce the possibility of dysphagic relapse caused by inadequate intervention.⁽¹⁶⁾ For this reason, various methods

have been used to ascertain the completeness of cardiomyotomy. Both per-operative endoscopic viewing and stationary pull-through four-channel manometry are effective but need sophisticated tools.^(7,15) In this study, a flexible esophageal dilator (Key-med dilator) was used; which provided a simple, quick and reliable way to assess the adequacy of cardiomyotomy. It can give per-operative evidence of any missed functionally diseased or constricting muscle fibers (when they are stretched by the dilator); both proximally and distally across the gastro-esophageal junction so that the line of dissection may need to be directed toward the patient's left at the terminal aspect of the myotomy to divide the sling and part of the oblique muscle fibers until the dilator is easily passed into the gastric lumen. In this study, using the dilator showed significant higher rate of excellent results than the traditional technique in which the dilator was not used (87% vs. 67%; Fisher exact probability test, $p < 0.005$). P. E. Donahue performed laparoscopic myotomy in 48 patients and intra-operative

endoscopy was then performed to determine whether there was residual constriction of the channel between the esophagus and the stomach. In his work, there were obvious constricting elements distal to the gastro-esophageal junction in 90% of patients that required extension of myotomy onto the stomach for an average of 15 mm. All but one had improved swallowing postoperatively; 8 patients required 'stretch' of the distal esophagus/cardia within the first year postoperatively and one patient was re-operated for fibrous scar obstructing the distal esophagus⁽⁷⁾. Lovecek M. and Grya A. evaluated the completeness of myotomy in 4 patients by using stationary pull-through four-channel preoperative manometry which demonstrated the decreased tonus of LES (the mean 42.06 mmHg before; and then 20.03 mmHg after myotomia). In one case, the finding resulted in necessary extension of the myotomia⁽¹⁵⁾.

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