# Management of achalasia in the gastroenterology and hepatology teaching hospital

***Dr. Laithalhadad**
****Dr. Abdulrazakalhilo**

## ABSTRACT

**Background:** Achalasia is the commonest specific primary esophageal motility disorder for which there is no cure.It causes dysphagia , regurgitation and loss of weight.The objective of this study is to evaluate the management of achalasia in the gastroenterology and hepatology teaching hospital **Patients and Method:** A thirty patients were diagnosed to have achlasia based on clinical , radiological , and endoscopic criteria, during the period from December 2009 January 2012 . Thirteen patients had Hellersmyotomy through trans-thoracic , abdominal and laparoscopic approaches and seventeen patients had pneumatic dilatation .The follow up of patients was done through clinic visits and the enquiry about relieving from dysphagia and any symptoms developed after intervention was done.The follow up period ranged between 4-19 monthes.**Results:** Fourteen patients were males with a median age of 30.41 years , and sixteen patients were females with a median age of 30.93 years . Dysohagia was the most common symptoms followed by weight loss and regurgitation . In the surgery patients group excellent results occured in 12 patients (92.3%) ,and 1 patient (7.6%) had poor result with reflux , while at the dilatation group 12 patients (70.5%) had excellent results , 4 patients (23.5%) with good results and 1 patient (5.8%) had fair result.**Conclusion:** Pneumatic dilatation and surgical myotomy both can be used as primary treatment for achalasia. Excellent results with long term relieve of dysphagia is better achieved with Hellersmyotomy.**Keywords:** achalasia, management

## Introduction:

Idiopathic achalasia is the commonest specific primary esophageal motility disorder .The term achalasia is a Greek ward 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 the myenteric ganglion cells with some neural fibrosis and variable degrees of chronic inflammation within the myenteric plexus. Recent studies showed selective destruction of non-cholenergic , non-adrenergic inhibitory neurons. The transmitters affected are nitric oxide and vaso-active intestinal peptide . This disorder is irreversible . Auto-immune and infectious factors are the most commonly accepted possible etiologies and auto-antibodies to myenteric neurons are present in as many as 50% of patients with idiopathic achalasia [1,2,3,4,5].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. The mucosa of the esophagus often shows esophagitis with mucosal ulceration. This is largely due to stasis and bacterial proliferation and fermentation consequent to retention of fooddebries(2,3).

Autopsy studies revealed 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). Acalasia of the esophagus affects males and females at all ages with equal sex incidence. The main symptom of achalasia are dysphagia ,regurgitation and chest pain. Dysphagia is mainly for solid food and of gradual onset with average duration of 2 years(2,3,6,7). The manometric profile that characterizes achalasia includes absence of peristaltic contractions within the esophageal body and incomplete relaxation of high pressure zone in response to swallowing (2,3,6) . There appears to be some vague correlation between the degree of esophageal contraction and tortuosity seen on X-Ray filmand the duration and severity of obstructive esophageal symptoms (7). The essential esophagogram features include birds-beak appearance of LES with incomplete opening , loss of primary peristalsis and delayed esophageal emptying (6).

* Consultant GIT surgeon ,gasteroenterology and hepatology teaching hospital
** Specialized surgeon gasteroenterology and hepatology teaching hospital

All patients with suspected achalasia should undergo upper G.I endoscopy with close examination of the cardia and gastro-esophageal junction. At endoscopy ,the esophageal body usually appears dilated ,atonic and often tortuous .Sometimes the mucosa is reddened ,friable ,thickened or even superficially ulcerated. The LES region remains closed with air insufflation ,however the endoscope will easily traverse this area with gentle pressure allowing examination of the stomach. If excess pressure is required the presence of pseudo-achalasia should be highly suspected (9). Currently there is no treatment that restores esophageal peristalsis and normalizes LES relaxation. Therefore ,the existing treatment of achalasia focus on reducing the pressure gradient across the LES ,thereby improving the gravitational esophageal emptying. The available trearments for achalasia includes : pneumatic dilatation ,surgical myotomy and endoscopic injection of Botulinum toxin. Some benefits may be derived from the administration of long acting nitrates and calcium channel blockers with initial response ranging from 50-70 / (1,2,3,4,). Surgical therapy shows the best long term results ,especially in young patients (8). Hellersintroduced esophagealmyotomy in 1914 by division of the muscle fibers of distal esophagus with an anterior and posterior incisions trough abdominal approach (Double myotomy) this technique is later modified by Groeneveldt and then Zaajier to single anterior myotomy(7,8) . 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 even more controversy about what anti-reflux procedure to perform. The most common cause for imperfect late result was failure to relieve completely the obstruction (7). There are 3 ways to tell that the myotomy is complete:

1- visual inspection of the esophagus and cardia while the esophageal lumen ia distended with alarge dilator.

2- The use of intra-operative manometry which may be unrleable (9,10).

3- The use of intra-operative endoscopy to determine whether there is residual constriction of the channel between the esophagus and the stomach(10,11,12).

**Patients and method:**

This is aretrospective and a prospective study representing the treatment of achalasia in the GIT center during the period from December2009 January 2012.The study includes 30 patient who were diagnosed to have achalasiaon the basis of clinical presentation and proved by BA. and OGD which showed the classical pictures of achalasia, which are dilated esophagus with abnormal or absent motility of esophageal body and birds beak appearance of the lower end on esophagogram. OGD showed tightcardia with dilated esophagus.Of the study group 17 patients had dilatation and 13 patients had esophageal Hellersmyotomy done through thoracotomy,laparotomy and laparocopic approach.

Thoracotomy

Under general anaesthesia with double lumen tracheal intubation and the patient in the right lateral position , Incision done through the left 7th Intercostal space. Division of the parietal plura done with mobilization of the esophagus into sufficient length.Myotomy done for about 10 cm. proximally and for no more than 2cm.at the stomach side with chest tube insertion.

Laparotomy

Undergeneralanaesthesia, supineposition, uppermedline incision done.The left lobe of liver mobilized and retracted to the right. The cardia displayed by dividing the peritoneum over the gastro-esophageal junction assested by downward traction on the stomach .An anterior extramucosalmyotomy done with an upward extentin for about 5-6cm and downward for about 1-2cm onto the stomach with Dor fundoplication in one case and Toupet in the other.

Laparoscopy

Under general anaesthesia ,supine lithotomy position and the surgeon standing between the patients legs,a10 mm cannula for the 30 degree laparoscopewas inserted in the midline 5 cm above the umbilicus.After creation of pneumoperitonium 2 10mm trocars introduced 1cm below the xiphoid and the other 2cm below the left costal margin in the anterioraxillary line.2 other 10mm ports inserted 1cm below the rightcostal margin in the right mid-axillary line and 7 cm to theleft of umbilicus.Elevation of left lobe of liver by retractor done then ,the phreno-esophageal membranewasopenedby a hook. Theesophagusseparated from the crura by blunt dissection, the vagus n. identified and preserved, .Myotomy done on the anteriorsurface of the esophagus using harmonic scalpel about 5cm upward and 1cm downward onto the stomach.No fundoplication done.

Dilatation

. Perform a complete endoscopy in the left lateral position with special attention paid to the cardia to exclude a tumor and assess for the presence of a hiatal hernia, then aguidewire is introduced into the stomach. The endoscope is then removed outside the patient and a balloon is passed over the guide wire ,.. Still in the left lateral position, a50 -cc syringe attached to the balloon port to pass air so as to inflate the balloon to 30cc ,under fluoroscopic control.

The disappearance of the balloons waist is the accepted sign of successful dilatation. .then we remove the balloon and the guide wire , and the patient is allowed to take liquids only in the first day.

**Result:**

There were 30 patients in our study ,14 males and 16 females .The range of age in the male group was 11-66 years ,the median was 30.14 years,while the range in females was between 17-50 years with amedian of 30.93 years.

**Table( 1 )Distribution of the study group according to sex**

| male | female | 0total |
|---|---|---|
| 14 | 16 | 30 |

**Table( 2) Distribution of study group according to age**

| sex | Range of age | Median age |
|---|---|---|
| male | 11-66 year | 30.41 year |
| female | 17-50 year | 30.93 year |

The most common symptom was dysphagia which occured in all 30 patients .the second most common symptom was weight loss which occur in 19 patients, 8 males and 11 females, followed by regurgitation which occur in 17 patients,10 males and 7 females.

**Table( 3) Distribution of the study group according to symptoms**

| symptom | male | female | Total no. |
|---|---|---|---|
| dysphagia | all | all | 30 |
| regurgitation | 10 | 7 | 17 |
| Epigastric pain | 2 | 1 | 3 |
| cough | 2 | 2 | 4 |
| Weight loss | 8 | 11 | 19 |
| Chest pain | 3 | 1 | 4 |
| Chest infection | 2 | nil | 2 |

The diagnosis of patients done by OGD and BA.Swallow in addition to clinical presentation. Both diagnostic procedures used to patients who had operation while only OGD ordered by the medical team

for those who had dilatation. The number of patients who underwent dilatation was 17 patients(56.66%),9 males and 8 females,and that who had operation was 13 patients(43.33%)5 males and 8 females.

**Table( 4) Distribution of the study group according to type of intervention**

| intervention | male | female | total |
|---|---|---|---|
| dilatation | 9 | 8 | 17 |
| surgery | 5 | 8 | 13 |
| total | 14 | 16 | 30 |

Of the 17 patient who had dilatation 12 patient (70.58%) [ 7 males and 5 females] had one dilatation,2 patients (11.76%) ,[1 male and 1 female] had 2 dilatations, 2 female patients (11.76%)

had 3 dilatations and 1 male patient (5.88%) had 4 dilatations.The median time interval between dilatation sessions in patients with multiple dilatations was 3.7months.

**Table( 5) Distribution of the dilatation study group according to the no. of dilatations**

| No. of dilatation | male | female | total |
|---|---|---|---|
| One dilatation | 7 | 5 | 12 |
| Two dilatation | 1 | 1 | 2 |
| Three dilatation | nil | 2 | 2 |
| Four dilatation | 1 | nil | 1 |
| Total no. | 9 | 8 | 17 |

Among the 13 patients who underwent surgical intervention,10 patients (76.9%) had open trans-thoracic myotomy,[3 males and 7 females]. 2 patients (15.38%)

had open abdominal myotomy[1 male and 1 female],and finally 1 female patient (7.69%) had laparoscopic myotomy.

**Table(6) Distribution of the study group according to the type of operation**

| Type of operation | male | female | total |
|---|---|---|---|
| Left thoracotomy | 3 | 7 | 10 |
| laparotomy | 2 | nil | 2 |
| laparoscopy | nil | 1 | 1 |
| total | 5 | 8 | 13 |

In the dilatation study group the procedure went smoothly without perforation in all patients. In the surgical group, 2 patients had esophageal mucosal perforation, 1 during open trans- thoracic myotomy , and 1 during laparoscopic myotomy. The patient with perforation during thoracotomy had previously 4 dilatations while that during laparoscopy with no previous dilatation.

**Table(7) showing the no. of patients who had perforation during various types of intervention**

| Type of intervention | male | female | total |
|---|---|---|---|
| dilatation | nil | nil | nil |
| thoracotomy | 1 | nil | 1 |
| laparotomy | nil | nil | nil |
| laparoscopy | nil | 1 | 1 |
| total | 1 | 1 | 2 |

Post operatively, 3 patients had simple chest infection 2 with thoracotomy ,and 1 with laparoscopy.1 patient had left pleural empyema[this patient had 4 previous dilatations followed by open thoracotomy].

**Table( 8) showing the Prevalence and type of post-operative complication**

| complication | male | female | total |
|---|---|---|---|
| empyema | 1 | nil | 1 |
| Simple chest infection | 1 | 1 | 2 |
| total | 2 | 1 | 3 |

Follow up of patients (range between 4 months-19 monthes) is conducted during clinic visits, and showed all patients to be benefited with regard to relieve of dysphagia.The effectiveness of intervention was evaluated following the criteria of Ellis et al [8]. In this criteria the results are divided into 4 groups :

1-Excellent: completely asymptomatic, gainedweight,and return to daily activity.
2-Good:Gainedweight,return to daily activity ,but with occasional dysphagia
3-Fair:improved ,but still complaining of some persistent dysphagia.
4-Poor:no improvement or the development of severe symptom other than dysphagia.In our study ,with the surgical intervention group 12 patients (92.3%/) had excellent results and 1 patient(7.6%) had poor result[the patient developed reflux] ,while at the dilatation group 12 patient (70.52%) had excellent results ,4 patients (23.54%) had good results and 1 patient (5.8%) with fair result

## Discussion

Esophageal achalasia remains a disorder of unknown etiology and with no definitive cure .It affects both sexes equally and the incidence peaks in the third and fourth decades of life[1,2,3].

The same thing applies in our study for the age at presentation, with a mean age of 30.14 years for males and 30.93 years for females. Symptoms rather than signs are the hallmarks of achalasia .in our study dysphagia was the most common symptom followed by weight loss and regurgitation respectively which goes with other studies that showed a similar sequence of symptoms prevalence[3,6,7]. EL-Hassani et al showed that about 90% of patients with achalasia present with dysphaghia ,regurgitation and weight loss, and the dysphagia was for both solid and liquids at presentation. This contrast with patients having stricture or ring whose dysphagia is limited for solids[16] .Achalasia can be associated with other pathologies ,such as esophageal diverticulum , hiatus hernia and peptic ulceration. In our study group there were no such associated pathologies.

Several therapeutic options have been adopted during the last century,such as pharmacological parasympathomimetic drugs , forceful dilatation and esophagomyotomy with variable patterns of safety and efficacy[10]

Surgical myotomy of the distal oesophagus has been shown to yield the best results in relieving the symptoms of achalasia when compared to other non-surgical techniques[11,12,13]

During the last decade, minimally invasive video-assisted techniques have enabled this procedure to be carried out successfully from both a laparoscopic and thoracoscopic approach[14,15].

However, there remains a paucity of data on the long-term results of Heller's myotomy via either of these minimally invasive approaches. Modified Heller myotomy, using either a trans-thoracic or a trans-abdominal approaches, has long been the surgical treatment of choice for achalasia.The criteria for successful treatment were based on subjective parameters by disappearance of symptoms and objective paramerers by post-operative BA.swallow and OGD. Thoracic surgeons ,and to a less extent general surgeons, carried out a left thoracotomy to perform a myotomy of the LES. If the caudal extent of the myotomy was carried on to the stomach for 2 to 3cm, a partial fundoplication was performed[.12].

In our study no fudoplication was done to all the trans-thoracic Hellersmyotomy , as the myotomy was extended distally to no more than 1 cm onto the stomach , this attitude goes with that of Streitz and colleagues[15], who limited their myotomy to the esophago-gastric junction, relying on the residual attachments of the phreno-esophageal ligament and the undisturbed configuration of the diaphragmatic hiatus to prevent gastro-esophageal reflux. General surgeons usually use the abdominal approach for Hellersmyotomy , the advantage of which is a more effective myotomy because the gastric portion of the myotomy can be performed quite easily with its concomitant anti-reflux procedure[.10].

The causes of early failure or persistent dysphagia in both approaches may not only related to incomplete myotomy , but there are other causes like: extremely poor esophageal body function (especially in long standing caseses) , peri-esophageal fibrosis and mechanical obstruction related to anti-reflux procedure. The causes of the late recurrence of dysphagia has been attributed to : bridging of muscle gap with scar tissue due to insufficient haemostasis , linear healing of the myotomy incision due to incomplete circumferential dissection of the incision and a stricture due to reflux esophagitis secondary to associated or a created hiatus hernia[.7,16]

In our study 13 patients underwent surgical myotomy of them , 10 had trans-thoracic myotomy without anti-reflux procedures, all of them had excellent results regarding relieving of dysphagia and none of them developed reflux .These results agreed with that of EL-Hassani et al and Godispoti et al who showed that trans-thoracic Hellersmyotomy to be an effective mode of treatment[16,17].

M .Codespoti and Andreollo et al found that GERD can occur after trans-thoracic Hellersmyotomy regardless whether an anti-reflux procedure added or not, therefore they concluded that it is not

necessary to concentrate to add this procedure which might cause functional obstruction especially if the myotomy was not carried to long distally[17,32].

2 patients in our study had trans- abdominal esophagealmyotomy with partial fundoplication both had excellent results with no dysphagia or reflux .Although their number is small and may be inappropriate to compare them to other studies, however O'Sullivan et al , Jekler J. et al showed that abdominal Heller smyotomy with partial fundoplication had excellent results regarding relieve of dysphagia[18,19,20] .The same thing is true for the only case in our study how had laparoscopic Hellersmyotomy . Abir et al and Douard and collegues showed the effectiveness of this approach in treating achalasia, [21,22,23,24].

In our study 17 patients had forceful balloon dilatation .Dilatation was the mainstay for non-surgical treatment of achalasia since 1674. However the benefits were for a short period of time in many patients .In our study 12 patients (70.58%) had excellent results ,while 4 patients (23.52%) required subsequent dilatation and 1 patient (5.88%) had no benefit at all from frequent dilatation. Our results are supported by that of Fellows JW. et al, Jacobs JB. Et al and several other studies which showed that 69.7% of patient had excellent results with single dilatation ,while 22.1% of patient required subsequent dilatations and 8% of patients had no benefit at all [24,25,26,27,28,29,30,31].

In a study done at the GIT center in Baghdad, Abdullah F. et al found that excellent results were achieved by a single balloon dilatation in 69% of patients, and 19.4% had recurrent symptoms that required another sessions [33]

However achalasia is a progressive disease with progressive functional deterioration of the esophageal body, Mineo et al found that in long standing cases with severe esophageal body functional deterioration and hugely dilated sigmoid shape esophagus Hellersmyotomy should be the first line of treatment as the response to dilatation in such delayed cases is most probably not encouraging and poor (33).In our study 2 patients(15.3%) had mucosal perforation during operation , one patient during trans-thoracic approach and the other during laparoscopic Hellers, both treated by immediate suturing , and oral intake delayed until the 7th post operative day ,this percentage of perforation in our study goes with that done by J . Black and colleagues who had a 16% mucosal perforation during myotomy(35) . post operatively 2 patients(15.3%) had simple chest infection and one patient (7.69%) had empyema which is similar to the results of J. Blak and Ermanno et al (35,36) . On follow up of the patients one patient (7.69%) had reflux symptoms treated successfully by PPI , in a Study done by Ermano A. et al one patient out of 17 (5.8%) had reflux symptom and treated with PPI (36)

## Conclusion and recommendations:

1-There is no definitive cure for achalasia.
2-The aim of treatment is to relieve dysphagia and permit the patient to swallow effectively.
3-Both pneumatic dilatation and surgical myotomy can be used as primary treatment.
4-Surgical myotomy is associated with high rate of definitive and long term relieve of symptoms.
5-We recommend that More attention should be paid for minimally invasive surgery (laparoscopy, thoracoscopy) in the treatment of achalasia , as it was proven to be an effective and safe method of treatment.

## Referances:

1-Cushieri A.In:Essential surgical practice ,4th edition,London:Arnold ,2002:183-260.
2-Jeffery H., Tom R. Esophagus and Diaphragmatic hernia.In :Schwartz SI (Ed) ,Principles of surgery ,8th edition ,New York ,NY : McGrow-Hill ,2004:835.
3-Mcfadden DW, Michael J. Benign disorders of the esophagus.In :Zinner MJ ,Schwartz SIet al (Eds), Maingots abdominal operations,10th edition ,London:Prentice Hall International Ink, 1997:843-858.
4-Marcelo FV:Coplexities of managing achalasia in a tertiary center:use of pneumatic dilatationHellersmyotomy and botulinum toxin injection.Am J gastroenterology 2004:1029-1036.
5-Ravider K:Hypertophy of the muscularispropria of the lower esophageal sphincter and the body of the esophagus in patients with primary motility disorders of the esophagus.Am J gastroenterology 2003;98:1705-1712.
6-Michael F. V:Diagnosis and management of achalasia.Am J gastroenterology 1999;94:3406-3412.
7-Glyn G:Esophagealmyotomy and gastro-esophgeal reflux. The surgical clinics of north America 1983:877-884.
8-Martino N.D.:TH=he effect of esophageal myotomy and myectomyon the lower esophageal pressure profile:intraoperative computerized manometrystudy.Diseases of the esophagus 2005; 18:160-165.
9-Ellis FH Jr, Olsen AM.Achalasia of the esophagus. In: MajorProblems in Clinical Surgery.Vol IX. Philadelphia, London.Toronto:WB Saunders Co,1969.
10-Vaezi MF, Richter JE. Current therapies for achalasia: comparison and efficacy. J ClinGastroenterol 1998;27:2135

11-Csendes A, Braghetto I, Henriques A. Late results of prospectiverandomised study comparing forceful dilation and esophagomyotomy in patients with achalasia. Gut 1989;30:299304
12-Malthaner RA, Todd TR, Miller L, Griffith Pearson F. Long termresults in surgically managed esophageal achalasia. Ann ThoracSurg 1994;58:1343-11347.
13-Ellis JrFH. Oesophagomyotomy for achalasia: a 22-year experience Br J Surg 1993;80:882-885.
14-Luketich JD, Fernando HC, Christie NA, Buenaventura PO, Keenan RJ, Ikramuddin S, Schauer PR. Outcomes after minimally invasive esophagomyotomy. Ann ThoracSurg 2001;72:190913
15-Streitz JM, EllisFH, WilliamsonWA ,etal. Objective assessment of gastoesophageal reflux after short esophagomyotomy for achalasia with the use of manometryand PH monitoring.JThoraccardiovascSurg 1996;111:107-113.
16-EL-Hassani NB,Mustafa W :Achalasia of the cardia .Iraqi postgraduate medical journal;1:15-17.
17-Godispoti M,soonSY:Clinical results of thoracoscopicHellersmyotomy in the treatment of achalasia.Eur J cariothorac Surg2003;24:620-624
18-Mansour KA, Symbas PN, Jones EL, Hatcher CR. A combined surgical approach in the management of achalasia of the oesophagus.Amsurg 1976;42 :192-195.
19-O'Sullivan GC. In: Hennessey JPJ, Cuschieri A, eds. *Surgeryof' the Oesophagus*. London: BalliereTindall, 1986: 144.
20-Jekler J, Lhotka J. Modified Heller procedure to prevent post-operative reflux oesophagitis in patients with achalasia.*AmJSury*1967; 113: 251-4.
21-Abir F, Modlin I, Kidd M, et al. Surgical treatment of achalasia: current status and controversies. Dig Surg 2004;21:16576.
22-Douard R, Gaudric M, Chaussade S, et al. Functional results after laparoscopic Heller myotomy for achalasia: a comparative study to open surgery. Surgery 2004;136:16 24.
23-Raiser F, Perdikis G, Hinder RA, et al. Heller myotomy via minimalaccesssurgery.An evaluation of antireflux procedures. Arch Surg 1996;131:5937
24-Vantrappen G, Hellemans J: Treatment of achalasia and related motor disorders. Gastroenterology 79: 144-154, 1980
25-Fellows JW, Ogilvie AL, Atkinson M: Pneumattcdrlatation m achalasia. Gut 24: 1020-1030, 1983
26-Jacobs JB, Cohen NL, Mattel S: Pneumatic dilatatron as the primary treatment for achalasia. Ann OtolRhmol Laryngol92:353-356 1983
27-Dellipiani AW, Hewetson KA: Pneumatic dilatation in the Med 58:253-258, 1986
28-Robertson CS, Fellows IW, Mayberry JF, et al: Choice of therapy for achalasia in relation to age. Digestion 40:244-250 , 1988
29-Sauer L, Pellegrini CA, Way LW The treatment of achalasia.A current perspective. Arch Surg 124:929-932, 1989
30-Gelfand MD, Kozarek RA: An experience with polyethylene balloons for pneumatic dilatation in achalasra. Am J Gastroenterol 84:924-924, 1989
31-Barkm JS, Guehud M. Reiner DK, et al: Forceful balloon dilation: An outpatient procedure for achalasta. GastromtestEndosc 36:123-126, 1990
32-Andereollo NA:Hellersmyotomy for achalasia:is an added reflux procedure necessary. Br JSurg 2005;74(9):765-769.
33-Abdulla F:Achalasia ,clinical evaluation and outcome of pneumatic dilatation.Gastroenterology and hepatology center,Baghdad 2004.
34-Mineo TC:Long term outcome of Hellersmyotomy in achalasic sigmoid esophagus.ThorcardiovascSurg 2004;128:402-407.
35-J .Black , A. N. Vorbach and J. Leigh Collis :Results of Hellers operation for achalasia of the esophagus. The importance of hiatal repair 2003.
36- ErmannoAncona ,MD , MacoAnselmino,MD, Giovanni Zaninotto,MD, Mario Costantini :Esophageal achalasia : Laparoscopic versus conventional open Hellers Dor operation 1998.