

Treatment of Cardiospasm by the Expanding Bag Technique

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THE object of this communication is not to present a new treatment for cardiospasm, but rather to re-emphasize the virtue of the more conservative and simple method of treatment by expanding bag dilatation, before resorting to the more drastic though admittedly highly effective method of the Heller myotomy operation. It would be generally agreed that where a certain objective can be obtained by two methods, one simple and easy and the other more drastic and complicated, the former should be the method of choice, provided that the results obtained from each are comparable. This then is the situation applied to the treatment of cardiospasm, which can be dealt with either by dilatation or by operation. However, for dilatation to be effective it is vitally important that an exact and meticulous technique be followed, otherwise the results will fall far short of those obtained by operation and the method will be discredited. It is the purpose of this report to describe this exact technique, and to report the results obtained in a small series of patients seen at the University of Saskatchewan Hospital in Saskatoon over the last six years.

It is interesting to note that dilatation and operative treatment of cardiospasm have gone through reciprocal alternating cycles of popularity. Thomas Willis of Oxford is credited with the first description of cardiospasm in 1679, and indeed was the first to use dilatation for treatment. He made for his patient a piece of whalebone with a sponge tied to the end of it, to act as a bougie.¹ Sir Astley Cooper is reported as having used bougies on two patients in 1821 and 1866.¹ Following the discovery of x-rays by Roentgen in 1895, the condition of cardiospasm was much more frequently recognized because it was readily demonstrated by a barium meal. Thus the beginning of the twentieth century represents the phase of treatment by dilatations, pioneered by such men as Russel, Sippy, Plummer,² Moersch,³ Hurst,⁴ Mosher⁵ and others. From 1900 onwards sporadic reports were published concerning various operative techniques for relief of the obstruction at the lower end of the esophagus. In 1914 Heller⁶ introduced his now classical operation, but strangely enough this excellent procedure was ignored for some 35 years. During this period of time the "plasty" procedures and anastomotic procedures held sway until the serious complications of reflux esophagitis and ulceration resulting from these operations were pointed out by Barrett and Franklin⁷ in 1949. Since 1950 the Heller operation has found general favour and is now widely used. Therefore it is to be noted

that over the last 10 years there have been many reports in the literature concerning the treatment of cardiospasm,⁸⁻¹⁵ but the majority of these have described the operative treatment of this condition and the good results therefrom. Little stress is laid on the technique and value of dilatation. One exception to this is a report of 100 patients treated by Schindler¹⁶ by forceful dilatation, with the claim that 95% of these patients were cured symptomatically. Another is the 1951 report of Olsen *et al.*,¹⁷ who reviewed 601 cases of cardiospasm seen in the Mayo Clinic from 1935 to 1947. They followed up 452 out of 555 patients who were treated by expanding bag dilatation, and reported that 272 of these 452 patients (60%) were relieved of their symptoms for from four to 16 years. It is to be noted, however, that most of the recent reports on therapy have been written by surgeons, and hence operative treatment has been unduly stressed.

THE TECHNIQUE OF EXPANDING BAG DILATATION

The expanding bag used in the University of Saskatchewan Hospital is the Mosher bag. It is simple to use and has been highly effective. It has six strips of radio-opaque material set into the wall, so that the exact position of the bag and the degree of dilatation can be seen under the fluoroscope (Fig. 1). It has a gauge attached to it, so that it can be distended to a pressure of 15 lb. to the square inch. The gauge has a luminous dial which

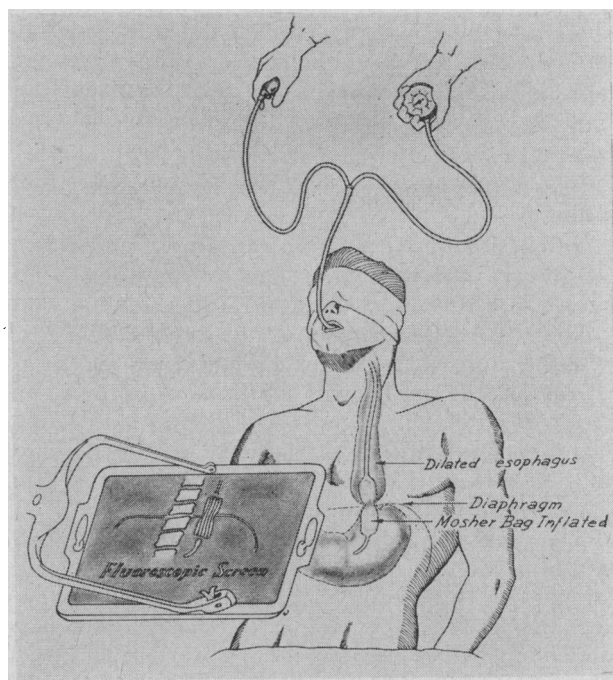


Fig. 1.—Pneumatic bag (Moshier) dilatation of cardiospasm under fluoroscopic control.

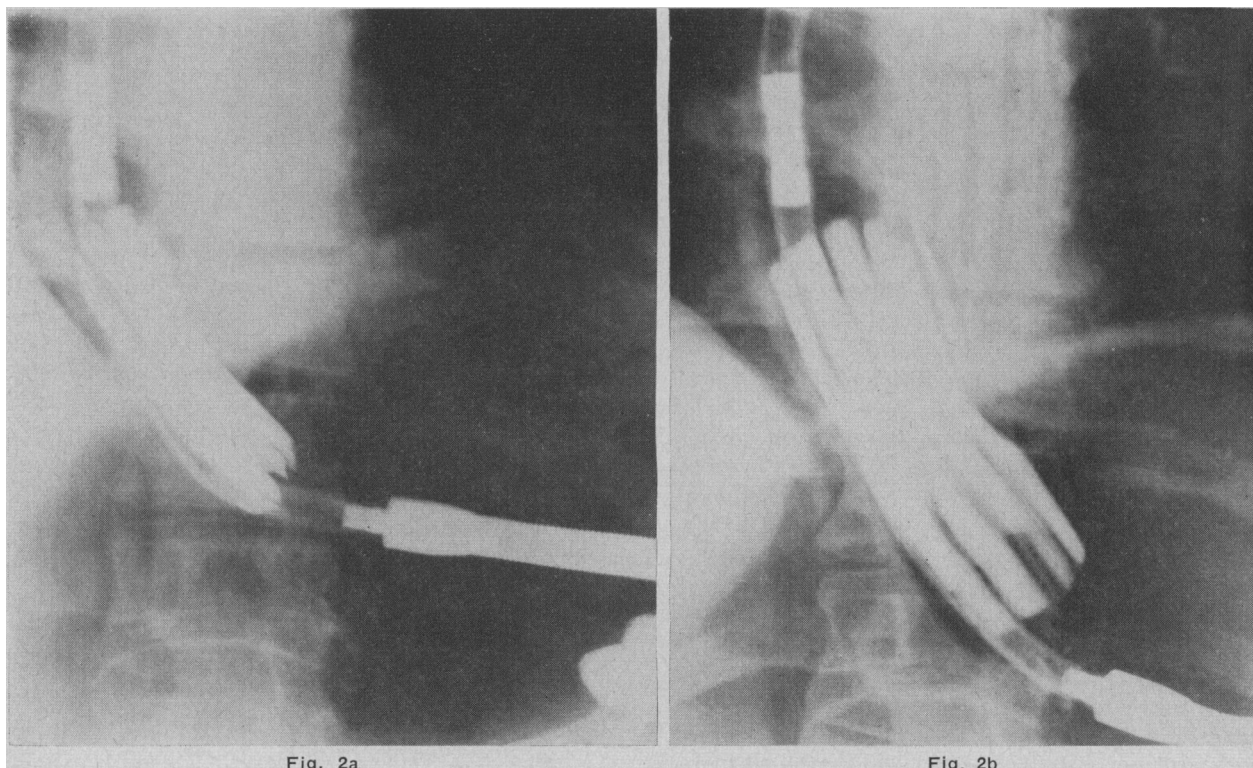


Fig. 2.—Radiograph of Moshier bag in position through the cardia. (a) Before distension. (b) Distended to 15 lb. to the square inch. Note indentation by cardia.

can be readily seen in the darkness of the fluoroscopic room. The author has modified the bag in two respects: (1) The flexible spring end has been shortened to half the original length because it was found to project too far into the stomach when the bag was correctly positioned. (2) The bag is introduced through the narrowed cardia by means of a flexible metal stylet passed down the rubber tubing. The method of introducing the bag over a swallowed thread as originally suggested, and for which the bag is designed, has not been used for the reason that it is cumbersome, unsatisfactory and unreliable. In many cases the thread will not pass the cardia in a patient with cardiospasm, but just curls up in the dilated esophagus.

The essential points in the technique are as follows:

1. The dilatation must be carried out under local anesthesia and not under general anesthesia. The reasons for this are twofold. (a) Under general anesthesia the cardia may relax, and forceful dilatation will therefore not occur; once the general anesthesia wears off, the cardia will return to its former constricted state. (b) It is essential that the patient experience some pain to indicate to the operator that a satisfactory dilatation is occurring. If no pain occurs, no good result can be expected.

The patient should receive adequate premedication so that he will not be unduly distressed or frightened by the procedure. Pantopon 20 mg. and scopolamine 0.4 mg. are injected subcutaneously one hour before the procedure is due to begin. Meperidine HCl (Demerol), 50-100 mg., is injected intravenously just before the procedure begins. The

mouth and pharynx are anesthetized by spraying with 5% hexylcaine HCl (Cyclaine).

2. The patient then undergoes esophagoscopy. This is essential to make sure that no organic obstruction exists (e.g. a malignant or a fibrous stricture) and the radiological diagnosis is thus confirmed. Furthermore, it serves as a useful means of emptying the esophagus of its retained fluid and food debris, which can be quite considerable in amount. This is sucked out by means of a wide-bore tube. The mucous membrane of the esophagus can thus be inspected, and any evidence of serious esophagitis and ulceration which would make dilatation hazardous can be seen. The puckered, rosette-like appearance of the cardia can be observed, and its failure to relax during inspiration noted. A Jackson esophageal bougie (size 14-16 French) is guided gently through the cardia under direct vision. This is useful to check the position of the cardia and, at the same time, the feel of the bougie passing through the narrowed area is informative. With cardiospasm, the bougie passes through quite readily, being only lightly gripped, whereas if the narrowing is due to a malignant or a fibrous stricture, it will be firmly gripped and it may be hard to introduce into the stomach. A proximally lighted esophagoscope, such as a Negus scope, is very useful for this condition, because often the tip of the scope will enter a cess-pool of debris as soon as the cricopharyngeus sphincter is passed, and this blots out the light in the distally lighted instrument.

3. The procedure must be performed under fluoroscopic control. It is essential to ensure that

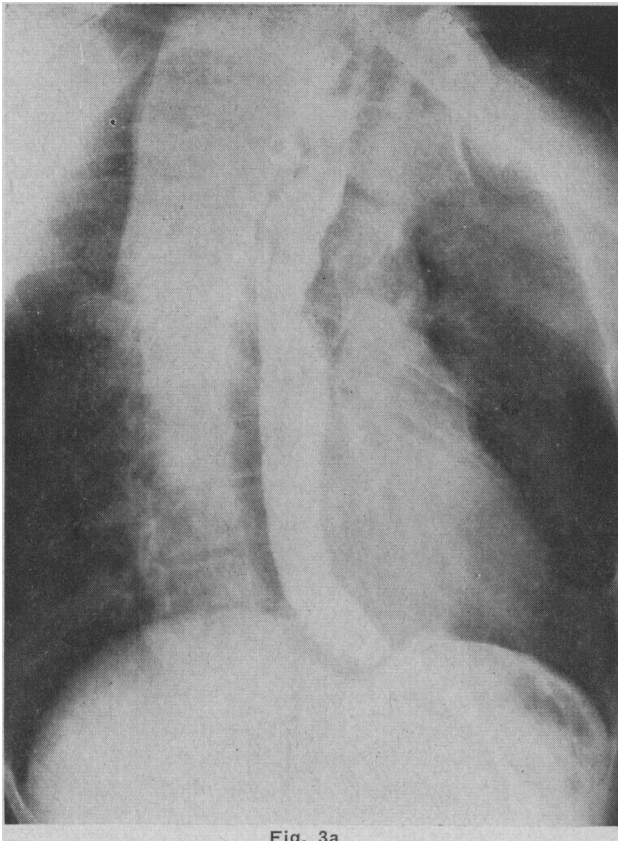


Fig. 3a

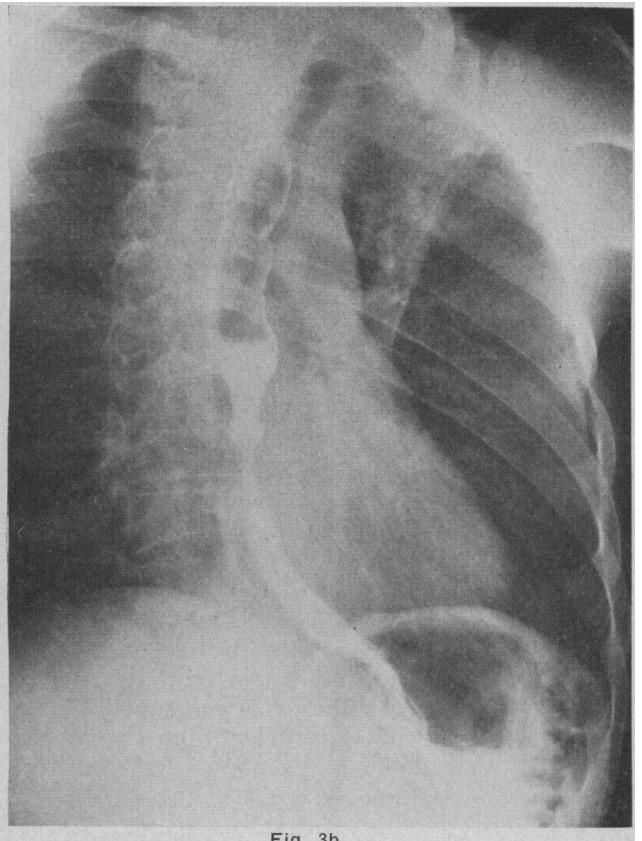


Fig. 3b

Fig. 3.—(a) J.H.: Male, aged 54 years. Nine months' history of dysphagia; could only eat pureed foods. Barium meal showing classical cardiospasm. (b) Barium meal taken four days after Moshier bag dilatation, showing free flow of barium into stomach and the return of the stomach bubble.

the bag straddles the cardia and that it is indented by the narrow segment as it is blown up. The radio-opaque metal strips in the wall of the expanding bag make such observation easy (Fig. 2). With the aid of an image-intensifier unit, it is possible to conduct the whole procedure in ordinary lighting, but even if this useful radiological adjunct is not available, ordinary fluoroscopic procedure in the dark is not difficult. The help of a dark-adapted radiologist is essential under the latter circumstances.

Therefore the whole procedure, both the esophagoscopy and the dilatation, is performed in the radiology department, on the fluoroscopic table. The esophagoscopy is carried out after the patient is drawn up on the table so that his head projects just over the end. Then, when the esophagoscope is withdrawn, the Moshier bag on its stylet is introduced into the esophagus by asking the patient to swallow. It is advanced till it is judged to have reached the cardia. The patient is then slid down the table until his head rests comfortably and his upper abdomen and lower chest come easily into the fluoroscopic field. The fluoroscope is switched on, and the bag is manipulated through the cardia under fluoroscopic control. The stylet is withdrawn. If the stylet is lubricated beforehand with mineral oil, its withdrawal is facilitated. The bulb and gauge is screwed on to the tubing connected to the bag, and the bag is blown up, again under fluoroscopic control, until the gauge shows a pressure

of 15 lb. to the square inch. Under the fluoroscope it should be evident that the centre of the bag is being indented by the narrowed cardia, and at the same time the patient should feel a moderate tearing type of pain in the epigastrium (Fig. 2). This blowing-up of the bag is performed rapidly three times, and the full dilatation is maintained for about 15 sec. each time. The bag is then withdrawn by simply pulling on the rubber tubing, and the procedure is finished.

The patient is instructed not to swallow anything for two hours until after the local anesthetic has worn off, after which he is permitted to eat and drink what he wishes.

4. The result of the dilatation is checked next day by a barium meal. Usually all holdup of the barium above the cardia has disappeared, and the barium flows freely through to the stomach (Fig. 3a and b). If this is the case, the patient may be discharged that day. If the dilatation appears inadequate, it is repeated two days later. None of the patients so treated by the author has required more than two dilatations.

DISCUSSION

Dilatation by the above technique expands the lower esophagus to a diameter of 1.43 inches, which is the diameter of the bag when fully expanded, and to a circumference of 4.2 inches. This in effect tears the constricting circular muscle fibres

at the lower end of the esophagus, and thereby effects a type of internal Heller operation or myotomy. This is why the patient experiences pain at the time of full dilatation and why it is essential that he should experience this pain if the procedure is to be effective. The mucous membrane of the lower esophagus will readily expand to this degree without tearing, but the muscle will not. Herein lies the safety and effectiveness of the procedure. Of course if the mucous membrane is inflamed or ulcerated because of stasis, such dilatation would be unwise.

Should subsequent dilatations be necessary over the following years, these can readily be carried out on an outpatient basis, and repeat esophagoscopy is not required. The whole procedure can then be completed in about 15 minutes. In actual fact, most successful dilatations do not need to be repeated at a later date.

It is therefore evident that by this relatively simple and easily bearable technique the patient can be relieved of his disability. In contrast, in the case of a surgical procedure such as the Heller operation, the patient requires an average hospitalization of 10 days and must undergo the discomfort associated with such an operation. Furthermore, the economic difference between the two procedures must also be evident.

It should be stressed, however, that a meticulous technique must be followed to ensure success. Dilatation by rigid bougies or by mercury bougies is useless and a waste of both the patient's and the doctor's time. It is true that such maneuvers may provide temporary palliation, but the degree of relief is not great and it does not persist for any length of time. This is understandable because the contracted circular muscle at the cardia merely snaps shut again as soon as the bougie is withdrawn. It is not ruptured by such a procedure. Furthermore, to give the patient mercury-weighted bougies to use at home is an unpleasant and unnecessary routine.

However, expanding bag dilatation is not always feasible or appropriate in all patients with cardiospasm. It should not be used for children¹⁸ or for patients who have a grossly dilated, "sigmoid", lower esophagus. In the latter type of patient it is difficult to introduce the bag into the stomach with safety.

Therefore the Heller operation is indicated for (1) children,¹⁸ (2) the patient with a sigmoid esophagus, and (3) the patient who relapses after a trial of adequate dilatation.

THE PRESENT SERIES

Seventeen patients with cardiospasm have been observed in the University Hospital in Saskatoon over the past six years. Eleven were males and six were females. The average age at the time of treatment was 45 years. Their ages ranged from 20 to 70 years. Their average age at the time of the onset of symptoms was 35 years. The duration

of symptoms ranged from two months to 32 years. Fourteen patients had a Mosher bag dilatation, but one of these failed to respond satisfactorily after two dilatations and he subsequently had a Heller operation. Therefore 13 patients were treated solely by dilatation with a Mosher bag (Table I). Eleven of these 13 patients have had excellent results and two have been improved but have residual swallowing difficulties. Only five of the 13 patients required more than one dilatation and none required more than two dilatations (Table II).

TABLE I.—METHODS OF TREATING 17 PATIENTS WITH CARDIOSPASM

Mosher bag dilatation	14 patients	
	1 subsequently needed Heller operation (incl. below)	
Heller operation	3	
	1 because of failed dilatation	
	1 because of sigmoid esophagus	
	1 because of surgeon's decision	
Bouginage	1	

It is pertinent to comment on the two patients who had only fair results from dilatation. One of these patients had a strong functional overlay. She also had a duodenal ulcer and, furthermore, the diagnosis of cardiospasm was never very soundly established in this case. The other patient had unsatisfactory dilatations because the technique described was not properly followed.

TABLE II.—RESULTS OF TREATMENT OF 17 PATIENTS WITH CARDIOSPASM

Mosher bag dilatation	11 excellent	2 fair
	(5 required two dilatations)	
Heller operation	2 good	1 fair
Bouginage	1 fair	

Therefore, of those patients who had a clear-cut diagnosis of cardiospasm and who had a satisfactory dilatation, all obtained excellent results. The term "excellent" implies that they can swallow any type of food without difficulty; that they have either gained weight or maintained their weight and have resumed normal eating habits.

Three patients were treated by the Heller operation. One of these was a man who had had two previous dilatations with the Mosher bag, one month apart, but who relapsed again three months after the last dilatation. Therefore he was subjected to operation and has had a good result. One patient had had his cardiospasm for 32 years. He had gross dilatation of the esophagus with a "sigmoid" lower segment. On esophagoscopy he had a grossly redundant, tortuous lower esophagus with boggy mucous membrane. Therefore he was subjected to a Heller operation as the treatment of choice because he was considered an unsuitable subject for dilatation. The result has been good, though he still has some dysphagia. His radiograph still shows dilatation of the esophagus, but barium passes readily through it into the stomach. The

third patient was operated on by a colleague who had a preference for operative treatment as opposed to dilatation, and dilatation was not attempted in this case. The result must be classified as only fair, in that this patient has to restrict her intake of solids considerably and increase her fluid intake, and she still worries greatly about her unsatisfactory swallowing. Therefore of the three patients who had Heller operations, two can be considered to have had a good and one a fair result. None of the three may be classed in the "excellent" category.

One of the patients had dilatation carried out by another colleague who used only the Jackson esophageal bougies. This patient has been improved but still has regurgitation of certain foods, especially if he lies down after eating, so that this result can be classified as fair only, which bears out the dictum that dilatation must be done with an expanding bag to be effective.

The methods of treatment and the results obtained with these 17 patients are summarized in Tables I and II.

It is interesting to note that, of these 17 patients, 10 had definite functional elements in their social background such as financial, business or marital troubles, which may have contributed to their condition. Two of the patients were brother and sister. Both were mentally defective and both came for treatment at the age of 20 years. Each was completely relieved by one dilatation.

SUMMARY

The technique of expanding bag dilatation of the lower esophagus for the treatment of cardiospasm has been described in detail.

It is stressed that this procedure must be performed under local anesthesia and under fluoroscopic control.

Three indications for a Heller operation are listed.

A plea is made for the use of expanding bag dilatations before resorting to operative measures because it can be expected to be successful in from 70% to 80% of cases.

Seventeen patients with cardiospasm have been observed over the last six years at the University of Saskatchewan Hospital. The main statistical data concerning these patients and the methods of treatment they received have been outlined. The results obtained are described.

REFERENCES

1. STEICHEN, F. M., HELLER, E. AND RAVITCH, M. M.: *Surgery*, 47: 846, 1960.
2. PLUMMER, H. S.: *J. A. M. A.*, 58: 2013, 1912.
3. MOERSCH, H. J.: *Langenbeck. Arch. Klin. Chir.*, 186: 456, 1936.
4. HURST, A. F.: *Lancet*, 1: 618, 1927.
5. MOSHER, H. P.: *Penn. Med. J.*, 26: 240, 1923.
6. HELLER, E.: *Mitt. Grenzgeb. Med. Chir.*, 27: 141, 1913.
7. BARRETT, N. R. AND FRANKLIN, R. H.: *Brit. J. Surg.*, 37: 194, 1949.
8. BARRETT, N. R. *et al.*: *Proc. Roy. Soc. Med.*, 43: 421, 1950.
9. ALLISON, P. R.: *Ibid.*, 43: 425, 1950.
10. BARLOW, D.: *Brit. J. Surg.*, 48: 642, 1961.
11. DOUGLAS, K. AND NICHOLSON, F.: *Ibid.*, 47: 250, 1959.
12. LE ROUX, E. T. AND WRIGHT, J. T.: *Ibid.*, 48: 619, 1961.
13. GAMMIE, W. F. P., JENNINGS, D. AND RICHARDSON, J. E.: *Lancet*, 2: 917, 1958.
14. WANGENSTEEN, O. H.: *Surg. Gynec. Obstet.*, 105: 339, 1957.
15. KAY, E. B.: *J. Thorac. Surg.*, 22: 254, 1951.
16. SCHINDLER, R.: *Ann. Intern. Med.*, 45: 207, 1956.
17. OLSEN, A. M. *et al.*: *J. Thorac. Surg.*, 22: 164, 1951.
18. PAYNE, W. S., ELLIS, F. H., JR. AND OLSEN, A. M.: *Surgery*, 50: 731, 1961.

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