

A SUBCLAVIAN ANEURYSM CURED BY CELLOPHANE FIBROSIS

PAUL W. HARRISON, M.D., AND JACOB CHANDY, M.B., B.S.

BAHRAIN, ARABIA

THREE YEARS AGO, Pearse¹ reported to the American Surgical Association that he had been successful in producing a gradual occlusion of the aorta in dogs. Wrapping the vessel with ordinary DuPont cellophane had led to a fibrosis which had eventually closed it off by its contraction. The ability of cellophane to produce this type of tissue reaction was used by Page² in the production of perinephritis with persistent hypertension. We ourselves have had occasion to study this fibrosis in experimental work on herniae.

Since the above report was made, we have had the opportunity to try out the method in two human cases. One of these attempts was successful, as indicated by the title of this paper, while the other eventuated in ligation of the involved artery with an unsatisfactory result.

Case 1.—On July 7, 1941, Hussein bin Mohammed, a weather-beaten, old pearl diver, age 70, or more, reported to the Mason Memorial Hospital complaining of very severe pain in his left shoulder. It was not entirely clear just when this pain started but apparently it had excited his attention for less than six months. Its intensity had greatly increased during the few preceding weeks.

Physical Examination.—The patient was a thin, hardy old man, in good general condition. The pain which was distressing him arose from a pulsating mass the size of a hickory nut, which appeared to be connected with the third portion of the left subclavian artery. There was a loud bruit and usually a palpable thrill. The pain radiated up into the neck and to some degree to the shoulder and upper arm. The mass itself was not tender. The systolic blood pressure in the left arm varied, but a reading of 130/70 was usually obtained. Roentgenologic examination of the shoulder area was negative. The Kahn test was negative. *Clinical Diagnosis:* Aneurysm of the third portion of the subclavian artery. Although it was realized that ligation of the subclavian can usually be carried out without gangrene of the extremity, it was decided to try the effect of cellophane fibrosis on this case.

Operation.—July 8, 1941: Under local anesthesia, with one per cent novocain solution with adrenalin, the mass was exposed by a three-inch incision below the clavicle. The intervening muscles were cut in the line of the incision. Adequate exposure was easily obtained. The aneurysm presented itself as a fusiform swelling in the course of the artery, about 2.5 cm. in length and 1.5 cm. in diameter. Two small arteries coming off the dilated portion were doubly ligated and cut. The aneurysm was carefully exposed and slightly more than one centimeter of normal artery both proximally and distally (Fig. 1).

Cellophane tape, one centimeter in width, was boiled and ready for use. We found that boiling is not the best way to sterilize the tape, because it was rendered so bodiless and fragile that it was almost impossible to lay it in place accurately. A five-layer band was applied proximally, and fastened with a single suture on the anterior surface. A less satisfactory application was made distally, after which the muscles were brought together as accurately as possible, and the skin was sutured.

The operative wound healed without incident. He developed an attack of malaria

in the hospital which was treated with quinine. His pain was unrelieved by operation. He had been told in advance that this would be the case, but he was much disappointed. He was discharged on the seventeenth postoperative day, after he had promised to return for inspection every month.

Subsequent Course.—In spite of his promise, the patient did not return for follow-up visits. In May of the next year, we posted a reward of five rupees for his discovery, and found him living only five miles away. He was now delighted with the result of the operation, for the pain was almost gone and he was planning to return to his work as a pearl diver. For our part, we were much disappointed, for the aneurysm was no smaller. Indeed, it seemed definitely larger, although this may have been due to atrophy of the overlying muscles which brought it closer to the examining finger. Moreover, its pulsatile thrust seemed as strong as ever. Between the aneurysm and the entering artery was a sharp groove which, at this point, reduced the diameter of the artery by at least one-half. This groove was astonishingly narrow, and we wondered if it would have been better to use a wider tape (Fig. 1 C).

The patient's general condition was good. He had improved somewhat with the disappearance of the pain. We hoped, but by no means felt sure, that there would be no further enlargement of the aneurysm. In any case, the fibrosis has progressed encouragingly. It seemed that with a little further contraction, the aneurysm must begin to shrink in size.

On October 28, 1942, five months later, the patient was observed again. He had not returned to his pearl diving because of age and general pains, but apparently it was not the aneurysm that kept him home. We were delighted to find that the aneurysm had shrunk until its diameter was about the same as that of the artery. The examining finger following the subclavian artery now felt only two sharp grooves, separated by one and one-half centimeters. It was interesting to note that the pulsatile thrust of this small remnant of the aneurysm was not notably less than that of the artery proximal to it. The systolic blood pressure was more stable now. It was maintained on the left side at a level about ten points higher than that on the right (left, 130/70; right, 120/80).

On February 8, 1943, the patient was looked up again. It was expected that the aneurysmal sac would be completely obliterated by this time, and this hope was not disappointed. The subclavian artery was interrupted by a deep groove, filled with a fibrous mass (Fig. 1 E). The size of the mass was difficult to determine; it was perhaps slightly more than half a centimeter in length. The pulse on the left side was perceptibly delayed as compared with the right. The blood pressure on the left was 136/96; on the right 120/72. There was no pain in the shoulder area, and cure appeared to be complete.

Case 2.—Jebber Musellim, a pearl broker, age about 70, came to the Mason Memorial Hospital, March 22, 1942, complaining of severe pain in the left shoulder. The history was very similar to that of the first case. The pain had increased so much during the preceding 48 hours that he was rather desperate and insisted that something be done at once.

Physical Examination.—The patient, a tall, thin man, in good general condition, except for the presence of bronchitis. Below the lateral portion of the left clavicle was a pulsatile mass, apparently a little smaller than that in Case 1. There was a loud bruit and palpable thrill.

The patient's pain was so severe that we urged him to come in at once for treatment. We explained that we greatly feared rupture and would suggest immediate operation. The patient refused this, and decided to try Arab medicine, and, sick as he was, he went home, where the region of his pain was branded with a red hot iron in a number of places. One vertical brand, half an inch wide and nearly two inches long.

was placed exactly over the pulsating swelling. These brands relieved the pain a little and he remained away from us for 48 hours. At the end of this time, he appeared and begged for the operation. He had been given sulfapyridine tablets to use at home, and his bronchitis was better. However, his temperature ranged from 100° to 101° F. The systolic blood pressure in both arms was 136. The Kahn reaction was negative.

Operation.—March 24, 1942: The exposure of the aneurysm was similar to that of Case 1. However, the skin incision was complicated by the presence of the branded areas. These areas had been cleaned with great care, and touched with carbolic acid. The incision missed all of them except the vertical brand over the swelling itself. In spite of these procedures, wound infection, which almost cost the patient his life, ensued. The futility of trying to sterilize the necrotic skin was obvious.

The aneurysm was found to be about 1.5 cm. in diameter. Distally, two branches of equal size left the swelling. Cellophane tape was wrapped about the artery proximal to the enlargement, and around each of the large distal branches. This time, the cellophane had been sterilized by a two-day immersion in alcohol instead of boiling, and it was easily handled.

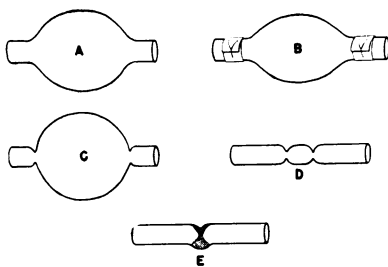


FIG. 1.—Diagrammatic representation of changes in aneurysm in Case 1. A. Pre-operative impression. B. Immediately post-operative, cellophane applied. C. Condition at time of first follow-up examination, May, 1942. D. Marked shrinkage of aneurysm noted Oct. 28, 1942. E. Last observation Feb. 8, 1943.

On the fourth postoperative day it was realized that infection had set in. On the sixth day the incision was reopened, with the escape of an ounce of pus. The infection seemed to be clearing up until, at midnight on the eleventh day, there was a profuse hemorrhage from the wound. The patient was found in a pool of blood, the bleeding having stopped for the moment. He was taken to the operating room and the wound was explored. There was found a tear of one of the ligated distal branches. The opening was plugged by a friable clot, which came away when touched, causing alarming hemorrhage again. This was checked by lifting the artery by means of its cellophane collar and temporarily occluding the lumen. It was out of the question to deal with this situation by means of cellophane tapes, so a triple ligation was carried out. The wound was then closed about a small drain.

The patient was given saline and glucose infusions. His left arm was kept encased in cotton wool. For the first 24 hours the arm was cold, and the patient complained of great pain. Following this, it gradually became warmer, and within a week the pain had practically disappeared. There was no definite paralysis but rather a general weakness of all muscle groups. The patient remained in the hospital 31 days. His wound healed firmly. There was no further hemorrhage. The weakness of the left arm did not improve and wasting of the arm became increasingly evident. At the time of his discharge, the circumference of the left arm at the midbiceps level

was three centimeters less than the right. There was marked interosseous atrophy. Small objects, such as a pen, could not be picked up.

About four months after the operation, a Pavaex machine was secured, and a half-hour of treatment was applied every other day for three months. There was slight improvement, so that he can now handle small objects better. It is probable that the arm will be permanently crippled.

SUMMARY

1. An aneurysm of the distal portion of the subclavian artery has been cured by means of the fibrosis induced by cellophane tape wrapped around the vessel.

2. It took ten months for the arterial occlusion to progress sufficiently to cause the aneurysm to diminish in size, and 19 months for the process to be completed.

3. A comparable case was treated by ligation, with the result that there is considerable disability in the arm.

4. We believe that this method of gradual arterial occlusion is valuable, and that it might be applied to aneurysms of other arteries, notably the aorta.

REFERENCES

- ¹ Pearse, H. E.: Experimental Studies on the Gradual Occlusion of Large Arteries. *Trans. Am. Surg. Assn.*, **58**, 443-457, 1940; *idem*: *ANNALS OF SURGERY*, **112**, No. 5, 923-937, November, 1940.
- ² Page, I. H.: The Production of Persistent Arterial Hypertension by Cellophane Perinephritis. *J. A. M. A.*, **113**, 2046, 1939.