

porary ligation, which is what is meant in the two cases of temporary ligature of the thoracic aorta, which I have mentioned. The ligature is simply tied, so as to rupture the inner and middle coats, and then removed. I need not detail the experiments on animals on which this method is based. Suffice it to say, that our expectations that the arteries of the human subject would behave in the same manner, has not been realized. We may, however, be led to a successful method of ligation, if we consider what is involved in the successful compression of the aorta by a compressor. It seems that the cardinal principle which should guide us, is the fact that this vessel will tolerate approximation of its walls through a large area, when it will not bear the compression of a narrow ligature involving the rupture of its coats. Is that not the lesson which these five successful cases teach us? It may be possible in this manner to bring about obliteration of an aneurismal sac without the obliteration of the main vessel. Even admitting that in these cases cited, the aorta was rendered impervious, we are then taught that it is possible for this to be done, and that the collateral circulation in the course of a few hours will render it possible for the tissues supplied by the original trunk to draw a competent supply from the anastomosis. To one or the other of these conclusions must we come in the light of these five cases. With regard to the practicability of performing the operation of ligation of the abdominal aorta, it may be observed that it has been done ten times, and that all the cases have been fatal. An analysis of the cases, however, fails to show that the ligation had anything whatever to do with the fatal result, except in one case. In four of the cases the operation was performed for the relief of hæmorrhage, which had already brought the patient to death's door. The remaining six cases were for aneurism. These ten cases may be tabulated as follows:—(1) Escape of inflated intestine; breaking of aneurism needle; long search for it in folds of mesentery; insufficient care in closing bleeding vessels. (2) Bladder disease. Dilated ureter. (3) Bursting of the sac by manipulation. Inclusion of ureter. (4) Fatty degeneration of heart. (5) Very complicated injury caused by the previous condition rather than by the operation, which terminated in a very different procedure than that intended. (6) Malignant disease of kidney. Nephrectomy. The four cases not included in this list, lived forty, forty-three, sixty hours, and ten days twenty-one hours. Therefore Barwell remarks, that the chief theoretical objection to the operation, oppression of the heart and lungs, seems to be met by these facts. The first patient died of peritonitis. Of the second case, the cause of death is not given. The third died of exhaustion after secondary hæmorrhage from the common iliac, for which the

aorta had been tied. Monteiro's patient, after living almost eleven days, died of secondary hæmorrhage. In his case the narrow ligature was used after the old method. In a suitable case, therefore, there does not seem to be anything in the history of these four cases to forbid us with improved methods of ligation to make the attempt to save life by placing a ligature, temporary or permanent, upon the abdominal aorta.

The recent work of Ballance and Edmunds on the ligation of arteries in continuity, one of the most valuable contributions to surgical science which has appeared in many years, offers suggestions which may render it possible, by using the knot and the method of ligation which they advise, to do what has never yet been done, successfully ligate the aorta. They insist that it is not only not necessary to divide the two inner coats of an artery to successfully occlude it, but that this is precisely what should be most carefully avoided. Their experiments show that it is only necessary to bring the inner walls of the vessel in contact and keep them there, and that the vessel is thus just as successfully occluded as in the old method, without the same danger of secondary hæmorrhage. For this purpose, the ligature should be flat, soft, broad, and with a knot, which shall not slip. For this purpose they have devised a knot which they have termed a stay knot. It is made as follows, quoting from the authors: "The best way of tying two ligatures is to make on each separately, and in the same way, the first hitch of a reef knot, and to tighten each separately so that the loop lies in contact with the vessel without constricting it. Then taking the ends on one side together in one hand and the two ends on the other side in the other hand, to constrict the vessel sufficiently to occlude it, and finally to complete the reef knot. The simplest way of completing the knot is to treat the two ends in each hand as a single thread, and to tie as if completing a single reef knot. This knot we have called the stay knot, and it is this which we recommend." I have had practical experience with this method, and think most highly of it. My first operation in my service at the Long Island College Hospital was the ligation of the femoral in Hunter's canal for the relief of popliteal aneurism, which was near rupture, and causing the man intense suffering. On examining the artery previous to operation, in Scarpa's space, I found it baggy. No other word expresses its condition. It had absolutely no resiliency. The man was seventy years old, and I felt sure that to use the narrow ligature would be to invite secondary hæmorrhage, even if I did cut clean through the vessel at the time, an accident which has by the way actually happened. I made up my mind to use the method which I have described, and to use six strands of floss silk, the material recommended. I found the