PATCHING OF THE ABDOMINAL AORTA WITH A PIECE OF RUBBER.*

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It has already been shown that part of an artery can be extirpated and replaced by a patch or a segment of an artery, a vein, or even peritoneum in a condition of active or latent life, and that the function of the repaired vessel remains normal. It has been found also that when hollow tissues, deprived of life, are grafted on an artery the vessel regenerates itself by using the dead vascular segment as a scaffold. In two recent experiments, I attempted to patch an artery with inorganic and organic foreign substances in order to ascertain whether they can be used in the reparation or in the permanent intubation of large vessels.

The first experiment gave an incomplete functional result, but showed how an artery can re integrate itself by the use of inorganic material.

Under ether anesthesia a segment of glass tubing of about five centimeters long coated with paraffin was introduced into the abdominal aorta of a dog. The pulsations of the femoral arteries remained normal. Six days after the operation, the animal was allowed to run. Paralysis of the posterior limbs developed and the pulsation of the femoral arteries disappeared. It was thought that the glass tubing had been displaced by the movements of the animal and that coagulation had occurred. Laparotomy was performed, the tube extirpated, and the aortic circulation re-established. The glass tubing was obliterated by a soft clot of recent formation. But it was found that the glass wall, inside of which circulation had taken place for six days, was covered by a thin, whitish membrane.

* Received for publication, June 9, 1911.
1 Carrel, Jour. Exper. Med., 1910, xii, 460.
2 Carrel, Jour. Exper. Med., 1910, xii, 139.
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A tube having the appearance of a thin-walled artery could be extracted from the glass tubing. Microscopical examination showed that it was composed of a dense fibrin infiltrated by many leucocytes. It is probable that if the dog had been quiet and the glass tubing had not been displaced, the fibrinous tube would have become organized and would have formed inside of the glass tubing a new intima, in the manner of the canalization of a dissecting aneurism.

In the second experiment, a piece of the anterior wall of the abdominal aorta was resected and replaced by a piece of rubber.\(^3\)

*Experiment.*—A medium-sized male dog. February 7, 1910, 9:45 A.M. under ether anesthesia, transversal laparotomy; intestines wrapped in greased silk towels and a wool blanket. 10:05 A.M. Dissection of the abdominal aorta below the renal arteries. Interruption of the circulation by two Crile forceps placed about 4 cm. from each other. Resection of a small piece of the anterior wall of the aorta. The opening is about 20 mm. long and 12 mm. wide. It is patched by a piece of thin rubber. At 10:36 A.M. the circulation is reestablished. There is some leakage at the line of suture, which is easily controlled by a few stitches. The abdomen is closed and the operation completed by 11:00 A.M.

After the operation, there was no modification of the femoral pulse, and the animal remained in excellent health.

May 26, 1911. The femoral pulse and the aortic pulsations are normal. There is a slight thickening of the anterior wall at the level of the patching, and the artery adheres to the thoracic duct. The aortic segment bearing the rubber patch is extirpated and examined.

The lumen of the vessel is normal. There is neither stenosis nor dilatation at the level of the patch, but the wall is thinned. On the external side of the aorta there is no evidence of the patch, and the adventitia is thicker than normally. The vessel is opened by an incision made on its posterior wall. The intima is smooth and glistening. The location of the resected piece, which appears as an oblong area, neatly circumscribed, although having about the same appearance as the adjacent parts of the vessel, is easily detected. A longitudinal section shows that the piece of rubber was present in the wall. On its external side, a new adventitia had developed, while its internal side was covered by a thick layer of intimal tissue.

To summarize, the part of the abdominal aorta extirpated and

\(^3\) This experiment was made at the suggestion of Professor Tuffier of the University of Paris.
replaced by a patch of rubber had been regenerated by the ad-
jacent parts of the vessel. The caliber of the aorta examined
fifteen mouths after the operation had not been modified, and the
function had not been impaired. The experiment indicates, there-
fore, that a foreign inert substance, under certain conditions, does
not produce an obliterative thrombosis, but can, indeed, be used in
the reparation of the wall of a large artery.