

ess, and can therefore give more rational after-attention than is possible when other flaps have been selected at the operation.

Dr. A. E. PRINCE, Springfield, Ill., said that in securing such a graft as Dr. Hammond mentioned the difficulty will be experienced of securing a graft of uniform thickness. Drawing the knife back and forth often produces a serrated graft. This difficulty may be overcome by taking a piece of sterilized board, say from an ordinary cigar box. Follow the edge of the board with a knife. The board will keep the skin perfectly straight and tense, and in that way any length of graft desired may be obtained. Dr. Prince has found that particularly useful in attempting grafts for the restoration of the orbit. It may be from faulty technic in the operation but it has been Dr. Prince's misfortune from time to time to have a little necrotic area follow.

Dr. CULLEN F. WELTY, San Francisco, believes there is no one method that covers all points in different cases. For this reason he uses different flaps in selected cases. He tries to close every case if possible and in those he can not close because of pathologic lesions, he uses the Panse flap. He thought it would be hard to adapt such a large skin graft to the cavity of the ear after operation. It would be much easier to adapt smaller pieces to the various recesses and corners that are naturally encountered, than to cover the entire cavity with a single graft. He does not think skin grafts should be used in cholesteatoma because the cholesteatoma dips into the individual caniculi of the bone and continues to grow. He would like to hear from Dr. Hammond about skin grafting over the stapes, whether it is not likely to diminish the hearing much more than by the ordinary process.

Dr. KASPAR FISCHER, San Francisco, showed a flap he has used for the last few years, and demonstrated his method as published in the *Archives of Otolaryngology*, xxx, No. 2, 1901. His method assures a well nourished covering of the bone trough, while skin grafts alone furnish poorly nourished tegument.

Dr. PHILIP HAMMOND, Boston, said he expected there would be more opposition to the use of either a second time during the operation; that is, doing the operation in two stages. He has pronounced views on the subject, however, or he would not subject the patient to this extra inconvenience. The cavity on which this operation is done of course contains more or less pus, granulation tissue and sometimes cholesteatoma. It is difficult to get the cavity clean and aseptic. The skin graft applied primarily to such a cavity is not as apt to take, in a large number of cases, as after there is good healthy granulation tissue. He packs the cavity with iodoform gauze and then does not touch it for 7 days. On the seventh day when taken out the gauze is as clean as when introduced. That gives a good clean healthy tissue on which to introduce the grafts. The question of the flap to be employed, whether the Körner or the Panse, of course varies according to the conditions. In some cases he has thought it necessary to use the Panse flap, but when he selected his case he prefers the Körner. It can be made as broad as the canal will permit. When thoroughly applied the flap helps to pin down the posterior wound that is sewed together and makes one solid mass.

As to facial paralysis, it requires considerable experience and some knowledge of anatomy to do this operation thoroughly and save the patient from paralysis. In something over 50 radical operations it has been his misfortune to encounter facial paralysis twice. In the first case there was a fistula leading from the mastoid cavity into the facial ridge. He wanted to get at the caries, and succeeded in removing it, but the patient suffered a facial paralysis. That was 2 years ago. To-day the paralysis has disappeared. The other case was that of a young girl, last year. On getting into the antrum there was distinct caries and much granulation tissue all around the facial nerve, which could be seen plainly in the diseased tissue. He left that as it was, but there was paralysis.

As to the use of a board in making a graft, Dr. Hammond referred to the excellent work done by his assistant, Dr. Tobey, in getting these grafts for all his private cases and most of his hospital cases. Dr. Tobey finds that he can get a decent graft by drawing the skin taut with the hand. In that way

there is little difficulty in securing a good graft. As to the question of hearing when the skin is laid over the stapes, Dr. Hammond has one patient in whom the hearing power remains at 20/35. In a still more recent case, the hearing increased from 1/35 to 10/35. As a rule there is a slight improvement in hearing following the operation. Regarding the ability to see into the mastoid cavity with the closed posterior wound, it depends entirely on how much of the mastoid is taken out and how much facial ridge is left. If the bone is removed close to the facial nerve there will be no difficulty in looking into all the parts, mastoid, antrum and middle ear.

ANASTOMOSIS OF BLOOD VESSELS BY THE PATCHING METHOD AND TRANSPLANTATION OF THE KIDNEY.*

ALEXIS CARREL, M.D., AND C. C. GUTHRIE, M.D.

CHICAGO.

DEFINITIONS.

The patching consists of closing an opening in the wall of a vessel by fitting and sewing to its edges a flap taken from another vessel or from some other structure such as the peritoneum.¹ For example, a portion of the wall of a carotid artery may be removed and the opening thus produced closed by a patch taken from the external jugular vein.

The anastomosis by the patching method consists of extirpating a vessel together with an area or patch from the vessel of origin, the patch being so cut that the mouth of the extirpated vessel is situated in the center of the patch. The edges of the patch are then fixed to the edges of a suitable opening made in the wall of another vessel. For example, a spermatic artery of a dog was dissected and removed with a triangular patch of the wall of the aorta surrounding its mouth. The edges of this patch were then sutured to the edges of a suitable opening made in one of the femoral arteries. The spermatic artery was thus anastomosed to the wall of the femoral artery (Fig. 1).

AIM.

We have attempted to develop a method of anastomosing blood vessels so that even in case of slightly imperfect technic resulting in the deposition of fibrin on the lines of suture, the circulation would not be disturbed.

In methods hitherto employed, a fault of technic was sufficient to cause hindrance or even stoppage of the circulation. In the simple transplantation of the kidney, for instance, the wall of the renal vessels is cut and sutured. Then it happens that, in case of infection, or fault of technic, fibrin deposits itself on the line of suture and occludes the lumen of the vessel, that gangrene or atrophy of the organ are very liable to result.

In the anastomosis by the patching method the wall of the renal vessels is respected. Instead of cutting the vessels themselves, we extirpate a patch of the aorta and vena cava, in the center of which is located the mouth of the vessel. The edges of the flap are sutured to the edges of the aortic opening. If infection occurs, a clot can be produced on the line of suture. But this suture is located far from the mouth of the renal artery. Thus, the circulation of the renal artery is not troubled. As regards the aorta, a small clot adherent to its wall does not disturb its circulation. Occurrence of gangrene in the transplanted organs is then almost impossible.

* From the Hull Physiological Laboratory, University, Chicago.

1. Carrel and Guthrie: "Resultats du patching des arteres." *Comptes rendus de la Societe de biologie de Paris*, June 22, 1906.

TECHNIC.

The operation may be divided into two stages: 1. Preparation of the vessel to be transplanted and, 2, transplantation on the second vessel. For example, the anastomosis of the renal artery to the aorta in the transplantation of the kidney will be described.

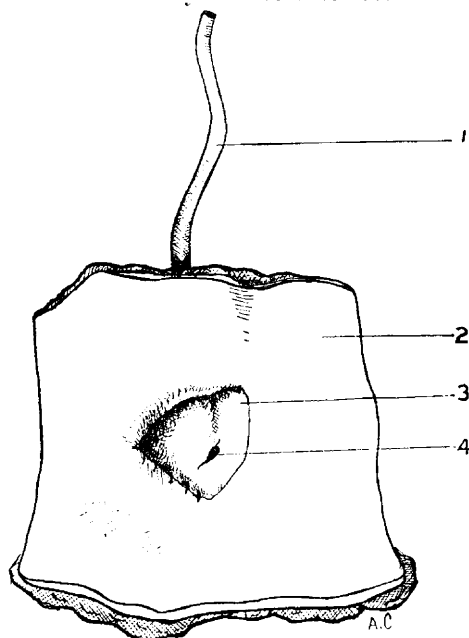


Fig. 1.—1, Spermatic artery; 2, wall of the femoral artery; 3, aortic patch; 4, mouth of the spermatic artery.

1. *Preparation of the Renal Artery and Aortic Patch.*—The aorta of the first animal is dissected to the level of the mouth of the renal artery. The renal artery, however, is not dissected. A patch of the aorta (Fig.

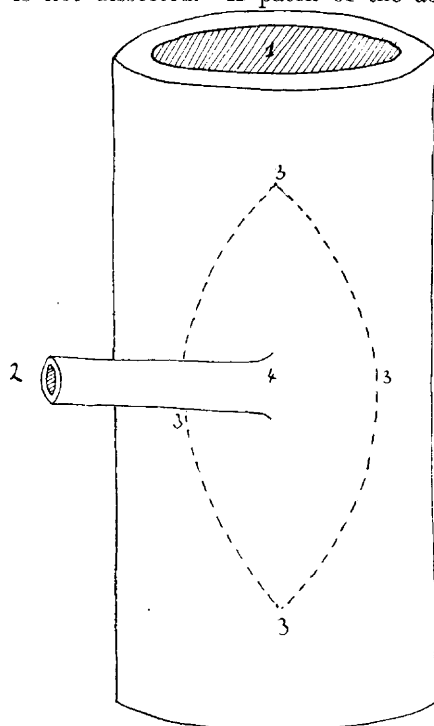


Fig. 2.—1, Aorta of the first animal; 2, renal artery; 3, line of incision for the aortic patch; 4, mouth of the renal artery.

2) surrounding the mouth of the renal artery is cut with scissors. The patch should be triangular or elliptic in shape and the edges as regular as possible in order that a smooth anastomosis can be made.

2. *Transplantation of the Patch on the Wall of the Aorta of the Second Animal.*—The aorta of the second animal is dissected between the mouths of the renal and genital arteries. The vessel being temporarily occluded

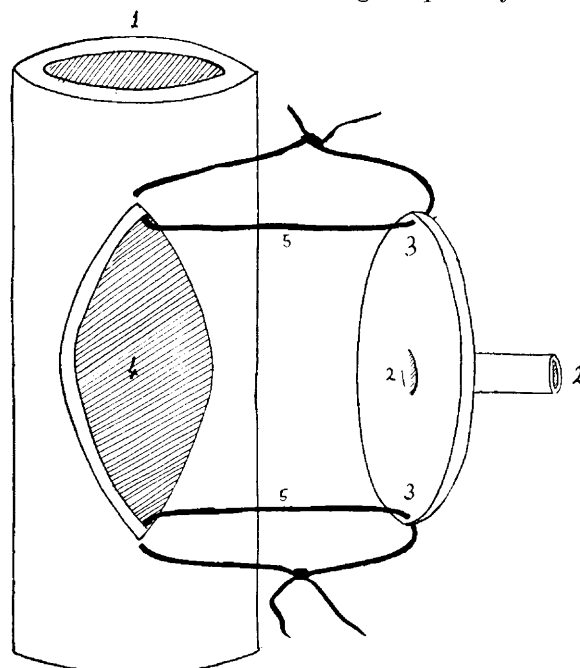


Fig. 3.—1, Aorta of the second animal; 2, renal artery; 2', mouth of the renal artery; 3, patch taken from the aorta of the first animal; 4, aortic opening; 5, threads uniting the ends of the patch and of the aortic opening.

both above and below, with one cut of the scissors an elliptic opening a little longer than the patch taken from the first animal is made in the wall of the aorta.

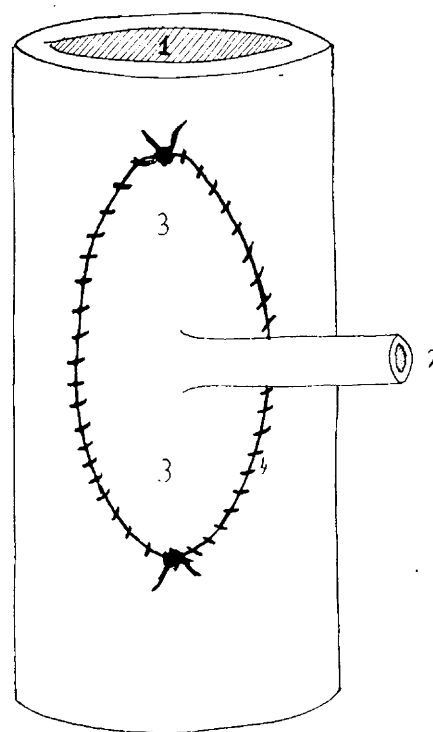


Fig. 4.—1, Aorta of the second animal; 2, renal artery; 3, patch of the aorta of the first animal; 4, continuous suture.

Each end of the patch is then fixed to the ends of the aortic opening by a single stitch (Fig 3). The edges of the patch and of the aortic opening are then united by a continuous suture (Fig. 4).

Anastomosis of the renal vein to the vena cava is performed in the same manner.

The circulation is re-established by releasing the vessels where they were temporarily occluded. The blood penetrates immediately through the renal artery into the capillaries of the organ and returns through the renal vein to the vena cava.

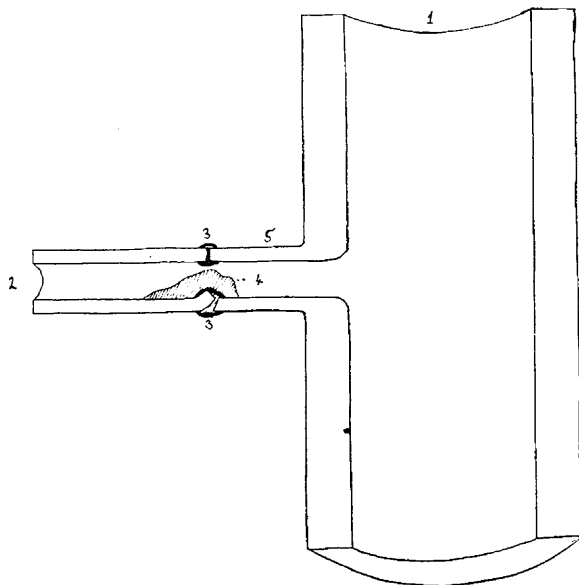


Fig. 5.—1, Aorta of the second animal; 2, renal artery of the first animal; 3, line of suture of the end-to-end anastomosis; 4, clot on a point of the line of suture, with almost complete obliteration of the vessel; 5, renal artery of the second animal.

At the line of suture of the aorta a little blood may escape. This hemorrhage ordinarily stops of itself within one or two minutes, but if it continues it is easily controlled by one or two supplementary stitches. The operation is less difficult on the veins owing to their

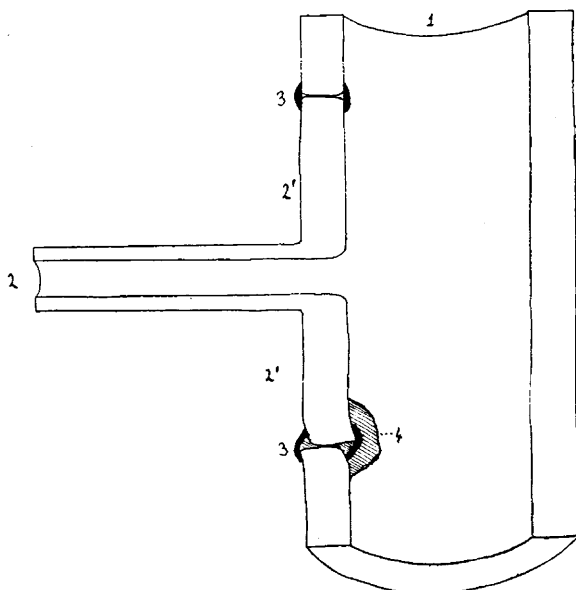


Fig. 6.—1, Aorta of the second animal; 2, renal artery and aortic patch taken from the first animal; 3, line of suture of the aortic patch to the edges of the aortic opening; 4, clot on the line of suturing.

greater flexibility. For this reason the line of suturing on the vena cava is usually blood proof.

The same method is well adapted to the anastomosis of the ovarian, spermatic and other vessels.

RESULTS.

This method has been employed on cats and dogs in fourteen cases of transplantation of the kidney, in one case of transplantation of the ovary, in several experiments of simple patching (i. e., repairing openings in walls of arteries by flaps of vein or peritoneum) and in some experiments in which the animals were killed at the end of a few hours, such as the transplanting the head of an animal in the abdominal region of another animal.

Although infection often occurred, the circulation in the organs has nearly always been good, and in no case gangrene of the transplanted organ (kidney or ovary) has been observed.

(a) *Anatomic Results.*—Within a few days after the operation, the stitches placed in making the anastomoses became covered with a glistening substance similar in appearance to the normal endothelium. In some cases there was a very small ribbon-like deposit of fibrin around the line of anastomosis. Irregularly shaped clots sometimes occurred at points of defective union of the intimas. In a dog that died eight days after the operation from diffuse phlegmon of the abdominal wall, a clot was found tightly adherent to one of the ends of

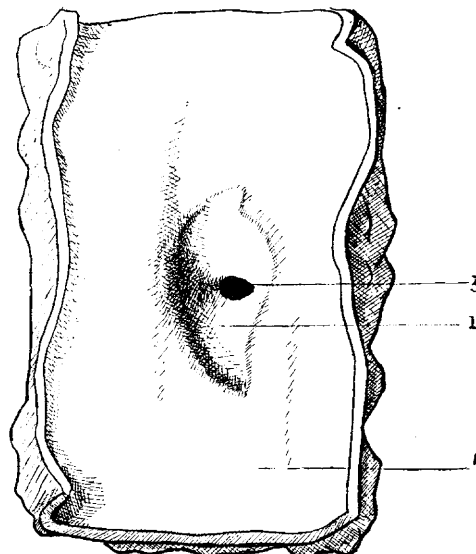


Fig. 7.—1, Wall of the aorta; 2, aortic patch; 3, mouth of the renal artery.

the patch. But the surface of the patch was smooth and the mouth of the renal artery was entirely unobstructed and normal in appearance. If such infection had occurred in a termino-terminal (Fig. 5) or termino-lateral anastomosis, obliteration of the vessel would probably have occurred. By the patching method, however, this accident had practically no effect on the circulation either in the aorta or in the renal artery (Fig. 6).

Anatomic union of the wall and the patch may occur rapidly after the operation. For example, fifteen days after transplanting the ovary of a pregnant cat into a small male kitten, it was practically impossible to distinguish the line of union of the patch of vena cava of the former to the wall of the vena cava of the latter. Also the union of the arterial anastomosis was excellent, the endothelium being smooth and glistening, but it was possible to distinguish the outline of the transplanted aortic patch. In some other cases small deposits of fibrin were observed on the line of the suture. They were very thin and, of course, did not interfere at all with the circulation. Specimens taken eight days, ten days,

eighteen days, twenty-seven days, forty-three days (Fig. 7) after the operation, and one taken five months after, show that the results remain excellent for these periods.

(b) *Physiologic Results*.—As soon as the blood is allowed to flow through the aorta, the circulation of the renal artery is re-established and appears to be practically normal. The renal vessels are surrounded by their connective tissue and protected by the peritoneum. Their caliber and their appearance are not modified. The kidney is a little redder, harder and enlarged.

Such animals walk, climb, jump and, in fact, comport themselves in a manner very like the normal the day following the operation and even, in some cases, within a few hours after the operation.

A cat into which a kidney had been transplanted was anesthetized eight days after the operation and its abdominal cavity opened by a transverse incision a little above the renal vessels. The transplanted kidney was found covered by glistening peritoneum without intestinal adhesions. The color of the kidney was a little redder, but practically normal; the organ was slightly increased in size. The circulation was excellent and even greater than before the operation. The only evidence of the operation was a bulging of the aorta and the vena cava at the point of anastomosis of the renal vessels. The excellence of the physiologic result was presumably in a large measure due to the insignificant alteration of the condition of the renal vessels and the ureter from the normal.

A female cat,² to which a kidney from another cat was transplanted four months ago, is now living in good health. The transplanted kidney is enlarged. Its consistency is a little harder and its form is normal. By palpation the pulsations of the renal artery are easily detected and appear to be normal.

These observations show that the results of the anastomoses by the patching method remain good for a long period.

CONCLUSIONS.

1. By the patching method, the termino-lateral anastomosis of blood vessels is more safely performed than by the other methods.

2. It prevents the occurrence of gangrene after the transplantation of organs even in case of slight infection.

3. The circulation of a kidney, transplanted with anastomosis of its vessels by the patching method, is excellent four months after the operation.

Clinical Notes

ACETOZONE IN TYPHOID FEVER.*

RAY HUMISTON, Ph.G., M. D.
WORTHINGTON, MINN.

For a number of years acetozone has been vigorously pushed in the treatment of typhoid fever, the manufacturers making the following claims:

1. A greater freedom from intestinal disturbances such as characteristic odor of stool, diarrhea, tympanites, hemorrhage, perforation, peritonitis.
2. A diminution of the toxemia, and the consequent improvement in physical and mental condition.

2. This animal was presented before the Section of Physiology of the meeting of the British Medical Association, Toronto, August, 1906.

* Read at meeting of Southwestern Minnesota Medical Society, Luverne, Minn., July 12, 1906.

3. The return to normal temperature more quickly.
4. A modification of the course, severity, and type.
5. Complications less frequent.
6. Relapses less frequent.
7. Recovery more prompt and certain.

We will see how far these claims are substantiated in a short series of 10 cases in which records have been kept; bearing in mind that the series is too short to indicate very much either way. All the patients in the series were treated by hydrotherapy with a milk diet. The acetozone solution contained from 15 to 20 grains to the quart, and was administered freely according to directions.

FIRST CLAIM.—FREEDOM FROM INTESTINAL SYMPTOMS.

Findings:

- One only had diarrhea.
- Nine had constipation.
- Odor of stool was modified in all cases.
- Tympanites was troublesome in but 2 cases.
- Hemorrhage was present in 2 cases.

SECOND CLAIM.—TOXEMIA DIMINISHED WITH IMPROVED PHYSICAL AND MENTAL CONDITION.

Findings:	Slight.	Moderate.	Severe.
Mental Impairment	4	1	5
Physical Impairment	3	2	5

These conditions seemed to go hand in hand. The subjects taking the most nourishment were most free from both conditions, hence suggesting free feeding to overcome mental condition.

THIRD CLAIM.—QUICKER RETURN TO NORMAL.

The fever was not considered absent until evening temperature was normal.

Findings:

Minimum number of febrile days	18
Maximum number of febrile days	109
Average number of febrile days	43
By omitting 2 cases with relapse the average is brought down to 31 days.	

FOURTH CLAIM.—COURSE, SEVERITY AND TYPE MODIFIED.

Findings:

Average evening temperature first week	102.6
Average evening temperature second week	102.4
Average evening temperature third week	101.4
It should be noted that when temperature was 102 cold baths were administered every 3 hours.	

FIFTH CLAIM.—COMPLICATIONS LESS FREQUENT.

Findings:

- Two had pneumonia.
- Two had hemorrhage.
- Six had no complications.

SIXTH CLAIM.—RELAPSES LESS FREQUENT.

Findings:

- One had 3 relapses, each of which took a typical course.
- Practically 4 relapses.

SEVENTH CLAIM.—RECOVERY MORE RAPID AND CERTAIN.

Findings:

- Rapid recovery, 6.
- Prolonged convalescence, 2.
- Deaths, 2; pneumonia, 1; hemorrhage, 1.

SUMMARY.

- Claim 1: Greater freedom from abdominal symptoms; claim justified.
- Claim 2: Toxemia decreased; claim not justified.
- Claim 3: Quicker return to normal temperature; claim not justified.
- Claim 4: Course, severity and type modified; claim not justified.
- Claim 5: Complications less frequent; claim not justified.
- Claim 6: Relapses less frequent; claim not justified.
- Claim 7: Recovery more rapid and certain; claim not justified.