Blood-vessel surgery and its applications

Guthrie Charles Claude
BLOOD-VESSEL SURGERY AND ITS APPLICATIONS
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BY

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GENERAL EDITORS’ PREFACE

The Editors hope to issue in this series of International Medical Monographs contributions to the domain of the Medical Sciences on subjects of immediate interest, made by first-hand authorities who have been engaged in extending the confines of knowledge. Readers who seek to follow the rapid progress made in some new phase of investigation will find herein accurate information acquired from the consultation of the leading authorities of Europe and America, and illuminated by the researches and considered opinions of the authors.

Amidst the press and rush of modern research, and the multitude of papers published in many tongues, it is necessary to find men of proved merit and ripe experience, who will winnow the wheat from the chaff, and give us the present knowledge of their own subjects in a duly balanced, concise, and accurate form.

Among the great advances in medical science which have been made in the first decade of the twentieth century, one of the most amazing is set forth by Professor Guthrie in his admirable account of Blood-Vessel Surgery. Co-operating with Dr. Carrel, he became a pioneer in the successful development of the new technique, and by its means carried to a successful issue some most extraordinary experiments on the transplantation of vessels and organs, culminating in the grafting of both kidneys with segments
of aorta and vena cava from one cat to another. From such an operation cats recover quickly, and the grafted kidneys for many days secrete a urine normal in amount and composition. But this state of good health does not continue, and after some three weeks the animal dies from some subtle impairment of renal metabolism, brought about by the heterogeneous nature of the graft. After a graft of its own kidney has been made, a cat has lived in unimpaired health for two years! Hereby we see the characteristics of each organ stamped with an individuality which prevents exchange even with another taken from the same species.

Professor Guthrie tells us that the successful method of carrying out blood-vessel surgery was initiated in 1899 by Dörfler, who employed fine round needles, fine silk, and continuous sutures which embraced all the coats of the vessel.

He gives the surgeon a full and detailed account of the exact methods of carrying out the operations of repair and union of blood-vessels, every step in the procedures being illustrated by an admirable series of figures. The results obtained so far show that completely divided vessels can be sutured with almost uniform success, the circulation continuing unimpaired through the united vessels. Carrel obtained success when he transplanted heterografts—e.g., segments of dogs’ vessels into cats—and even after keeping the grafts for many days in an ice-chest!

Guthrie has successfully engrafted segments of the abdominal aorta of a cat and of a rabbit between the ends of the divided common carotid of dogs, and lastly—more wonderful than all—has engrafted into the carotid of another dog a segment of dog’s vena cava which had been preserved for two months in formalin and then treated successively with dilute ammonia, alcohol, and paraffin oil.

He gives us a picture of a fat and smiling pug-dog, in which the carotid artery was pulsating three years after the introduction of
the dead and hardened graft. Such grafts act as a scaffolding for
the ingrowth of fibrous tissue and the spread of the intima from
the living vessel. Meanwhile the smooth inner lining of the dead
graft adequately conducts the circulating blood.

The experiments of Carrel and Guthrie bring within the realms
of possibility, under favourable conditions of locality, the removal
of an aneurysm and the restoration of vascular continuity by
the insertion of a sterilized graft taken from the post-mortem
room.

The physiological application of the methods of blood-vessel
surgery quickly followed on their perfection. Not only kidney,
but thyroid autografts have proved adequate in function. It is
possible for the surgeon to locate such organs in new places—e.g.,
the kidney can be placed in the neck and functionate when supplied
by the carotid artery. So far only the autografts of organs have
continued to carry on their function for long periods of time.
Heterografts succeed at first, but inevitably fail after the first few
weeks. This is the disappointing but unanimous conclusion of the
experimentors. Thus there is, at present, no temptation for the
enthusiastic surgeon to try and graft one lobe of the thyroid or a
kidney taken from a healthy donor. The poor man will not be
tempted to exchange one of his sound kidneys for so much hard
cash. It would be interesting to see whether a graft from one of
a litter to another would succeed.

The limb of an animal has been removed and engrafted, and the
limb has survived for many days; no one, however, has succeeded
yet in obtaining a return of function in the limb. The cripple
cannot yet hope to have grafted on him another leg taken from
some unfortunate who had just been accidentally killed.

It is interesting to note that the experimental results obtained
do not lend any support to the view that deficiency of an organ
is necessary for the survival of a graft of that organ.
In carrying out autografts, Professor Guthrie has shown that perfusion of the grafts with physiological salt solution is a disadvantage. Kidneys engrafted without perfusion give much better results. He has found human hairs form excellent material for stitching blood-vessels together. Such ligatures are easily obtained and prepared.

His most astonishing results have been obtained by the successful grafting of hens' ovaries (without vascular anastomosis). The grafts have taken and lived, and the hens have laid eggs from which chicks have been hatched. Pure black Leghorn hens have been grafted with ovaries taken from pure white Leghorns, and vice versa, and the hens have been covered, some by cocks of their own hue and others by cocks of opposite colour. Spotted chickens have resulted, while all the controls have bred true. The evidence is in favour, then, of foster-mother, or soma, influence.

Professor Guthrie discusses the results in relation with "graft-hybrids" and Darwin's views of the same. Graft-hybrids are produced by joining two young stems or two pieces of potato tuber together, each piece being taken from a different variety. The plants thus raised yield numbers of new forms of tubers, many of which appear to be of intermediate character.

It is a question whether "soma influence" really was at work in Guthrie's experiments, or the alteration of nutritional conditions increased the number of variations arising spontaneously in the egg-cells. Those who are interested in the problems of heredity will find much of interest in these experiments.

In the last part of the book Professor Guthrie discusses Resuscitation and Shock, and gives an admirable account of the scientific evidence on which is established the period of survival of the organs after a temporary cessation of the circulation. The author rightly attributes traumatic or psychical shock to a general inhibitory
state, and is wise in his suggestions as to treatment of this condition.

Professor Guthrie has given us a most suggestive and valuable work, full of material of immediate practical interest to the surgeon, the physiologist, and to him who studies the problems of heredity.

LEONARD HILL.
WILLIAM BULLOCH.

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