

Syme's Amputation

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This issue of ARTIFICIAL LIMBS is, and always will be, a classical contribution to everything pertaining to Syme's amputation, including, as it does, the most detailed and accurate description extant of the proper method of doing the amputation.

It has to be remembered that Syme was the greatest of the pre-Listerian surgeons and, indeed, his operation was developed to combat the disastrous septic complications that so often beset the surgeon who dealt with compound fractures, especially where the bone was divided, in contrast to cases that were disarticulated. The fear of sepsis was no longer a real one after Lister's discovery, but that there were other and great advantages in this operation is proved by the fact that Syme's operation is still recognised by competent surgeons as a method of choice in the suitable case. But there have been criticisms of the operation. Harris has stated the reasons for this difference of opinion. He believes that these lie in the method of the operation and in the after-treatment. Various imperfections of the end-results and the methods of their avoidance are described. Most of these can be avoided by a careful technique, and if this were generally practised there would be fewer complications about this excellent operation.

Harris reminds us of an important feature of anatomy not generally recognised. This is the specialised form of elastic adipose tissue developed between the calcaneum and the plantar aponeurosis which is resistant to pressure. There are here pockets of fat enclosed by dense septa of fibrous tissue. These fibrous tissue strands are in the form of the letter "U," with the open end of the "U" pointing towards the calcaneum. If this concept is true, it is obvious why the dissection of the heel flap should be close to the calcaneum, because if these little loculi are opened, as will happen if the dissection is through the subcutaneous layer, the fat content is extruded and an important weight-bearing mechanism rendered useless.

All modifications, apart from Syme's own one, have detracted from the good qualities of the Syme stump and, indeed, have often ruined its weight-bearing qualities and brought the modified Syme's operation into disrepute. Kelham

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and Perkins, of the British Ministry of Pensions, are often quoted for their strong objection to this operation, and they concluded their article by expressing the hope that the modified operations would soon be as dead as the original Syme. But their remarks were not based on the original Syme, and so it is not remarkable that they hoped that their modified operation would become obsolete.

Modifications like that of Elmslie only lead to failure by reducing the weight-bearing area and making the positioning and fixation of the heel flap more difficult. The plane of transection of the tibia should be so placed that the minimum of bone is removed and the largest possible cross-section of the tibia remains, and that, of course, should be parallel to the ground.

It is good to know that the opinions of the British Ministry of Pensions at Roehampton are now very different. The Chief Medical Officer there believes that a Syme amputation is the operation of choice and he adds that "nobody would persuade me to have a below-knee amputation if I could have a Syme."

Opinion on durability, too, seems to have changed. Many of the cases seen at Roehampton have had little or no trouble over 30 and 40 years. Shellswell quotes a case who had no trouble in 74 years of limbwearing and in his investigation of 305 Syme's amputations with an average follow-up of 29.6 years he found that 66 percent had satisfactory stumps.

Harris points out that an imperfection that is commonly overlooked is the misplaced heel flap. So often after the operation the patient is sent out of the theatre to have the bandaging and the dressing completed. A little too much pull inwards or outwards produces—and permanently—a flap which is not exactly beneath the centre of the cut lower end of the tibia. Harris secured this correct position by strips of adhesive plaster. A plaster-of-Paris support has also been suggested, and a very secure method is to fix the stump by a nail or pin driven up through the lower end of the tibia.

Gordon Dale, who has had an immense experience when in charge of all amputations for the Canadian Department of Veterans Affairs, discusses the use of the Syme amputation in peripheral vascular disease. This is an interesting review of the subject with a detailed description of typical cases. The first Syme amputation for thromboangiitis obliterans was done as far back as 1925, and since then it has been used in such cases whenever it seemed warranted. By 1940 this amputation had been used successfully for a wide variety of conditions, including perforating ulcers, in unrecovered sciatic lesions, cauda-equina lesions, frostbite, arterial occlusion, and gangrene from peripheral arterial disease. Dale showed by demonstration of actual cases the great value and durability of these amputations in active life, and in so doing was able to refute the views on durability expressed by the British Ministry of Pensions.

The biomechanics of the Syme prosthesis are reviewed by Radcliffe and particularly the locomotion pattern and the manner of weight-bearing for a Syme amputee. In an analysis of the process of human locomotion, the walking cycle is divided into two phases—the stance phase and the swing phase—and these are reviewed. The energy curves are most interesting and give some

insight into the complexity of knee-ankle interaction in normal human locomotion. Because of the inherent limitations in available space in the Syme prosthesis, attempts to introduce ankle action have been for the most part unsuccessful. Because in this limited space the Syme amputee cannot achieve the same degree of function as the above-knee or below-knee amputee wearing a SACH foot, the function will in general represent an improvement over the result to be had with the usual articulated joint. This is perhaps an understatement, for when the knee joint on the prosthetic side assumes a greater proportion of the shock-absorption function as evidenced by increased knee flexion under load just after heel contact there is much less deviation from the normal gait.

The actual prosthesis is described in a further article. In a review of the history it is apparent that there has been a gradual improvement since the beginning of the century, though even in 1940 the device was bulky, uncomfortable, and generally subject to mechanical failure. With the introduction of plastic laminates into the practise of prosthetics, research workers have been able to alleviate to a great extent the shortcomings of the designs then currently in use, and now excellent and enduring results have been obtained in a large number of Syme amputations observed in Canada. There seems to be little doubt but that the results in Canada, superior apparently to those in Great Britain, have been due chiefly to adherence to the classical procedure of Syme. In this connection, it is said that "Syme was seldom if ever meticulous as to detail," which is hardly consistent with the views of a famous assistant of Syme's, Joseph Bell, in expressing the special character of Syme's method of operating, nor indeed with his reputation in Edinburgh.

The present prosthesis is the result of research undertaken by the National Research Council of Canada, an activity initiated by Dr. Harris in 1944, though it was not till ten years later that the device had sufficient merit to warrant its general adoption. This is known as the "Canadian-Type Syme Prosthesis," or more simply, in Canada, as the "Plastic Syme." Among the essential features is a socket made of laminations of Fiberglas applied to a plastic mould of the stump and bonded with a rigid epoxy resin. It is lined with foam rubber, and the stump is inserted posteriorly. There is no ankle joint, and the foot is of the SACH type. This prosthesis is stronger, lighter, and much neater than anything produced before and is now in general use, and we have in the last two articles the considered opinion on it from Canada and America. It is stated in the first of these that its chief advantages lie in its improved appearance with reduced weight, its improved durability by virtue of a stronger structure, its freedom from mechanical troubles, and its reduced cost.

This issue of ARTIFICIAL LIMBS leads one to the conclusion that the Syme's amputation is a very good one when properly carried out and properly cared for afterwards. The limb, too, that is in common use as described is a vast improvement on the older *types* and permits a gait that is not much short of normal.