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USE OF THE PNEUMATIC SPLINT AS A COMPRESSION DRESSING

J. TED HARTMAN, M.D.

Department of Orthopedic Surgery

THE pneumatic splint described by Gardner,[1] and exhibited at The American Medical Association Convention in 1962, at the American College of Surgeons Convention in 1962, and at the American Academy of Orthopaedic Surgery Convention in 1963, has been used by me as a compression dressing for the lower extremity after 26 knee operations. The procedures included meniscectomy (15 cases), synovectomy (7 cases), arthrotomy with loose-body removal (3 cases), and excision of a Baker's cyst (1 case).

The inflatable splint* used is a double-walled sleeve of transparent 0.002-in. plastic film. As air is forced in between the two layers, the inner layer compresses the limb while the outer layer, tending to elongate, exerts traction and a splinting effect. Since this device applies (to a single extremity) the principle of the aviation garment or G-suit, it is popularly referred to as the "G-splint." It is designed to be inflated by mouth, and when so inflated it cannot impair the circulation of the limb.

This principle of air-pressure dressings has been under investigation for many years. It has required considerable expenditure of time and effort to develop a leak-proof collapsible valve, adaptable to the sheer material considered essential to safety in prolonged use.

The method of application in the 26 cases varied, but to date it appears most satisfactory to place Telfa* immediately over the wound, and then the sterile splint

**Supplied through the courtesy of Mr. W. O. Ellson, Director, Medical Research, Bauer & Black Division of The Kendall Company, 411 Lake Zurich Road, Barrington, Illinois. (The trade name of this splint is Immobil-Air.)*

directly over the Telfa, or over bias-cut stockinette material wrapped over the Telfa. The splint is inflated by mouth just before the tourniquet is released. A comfortable inflation pressure is 30 mm. of Hg, at which pressure the inflated splint can barely be indented with a firm finger.

The foot has been included within the air splint, in some cases, whereas in others the foot was allowed to protrude beyond the splint (*Fig. 1*). In no instance

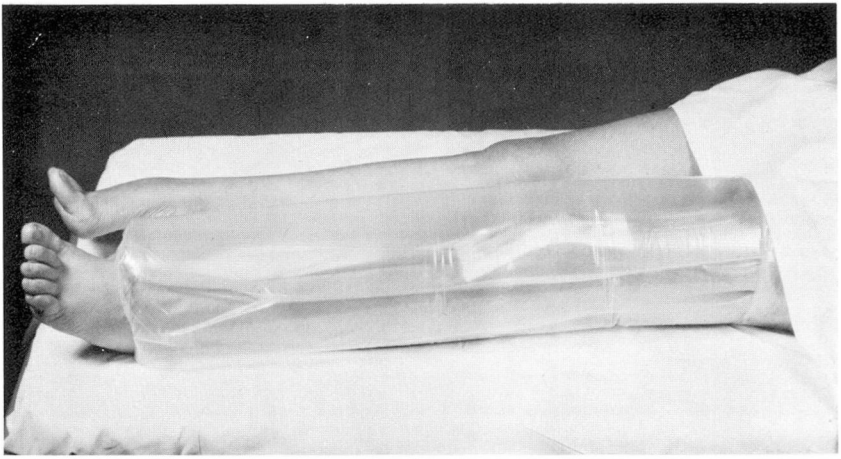

Fig. 1. The air splint in use as a postoperative compression dressing after medial meniscectomy. The splint was inflated to a pressure of 30 mm. of Hg.

did the protruding portion become edematous, a problem that always threatens the use of an elastic bandage similarly applied. The explanation of the lack of swelling is not apparent and is currently being investigated. The limb in the splint is suspended on a cushion of air. Since the pressure of an enclosed gas is equal in all directions, the inflated sleeve exerts absolutely uniform compression over the enclosed cutaneous surface.

In two of the earlier splints, leakage was such as to require frequent reinflation. Another five splints leaked so slowly that with occasional reinflation the compression was effectively maintained. The leaking valves were of early models with two exceptions, and this problem seems to have been overcome with the current model of the splint.

In the 24 instances in which inflation was properly maintained there occurred no edema, and at most just a trace of effusion, in the knee joint. The splint was removed after 48 or 72 hours (*Fig. 2*) and was replaced with a lightly applied elastic bandage.

The results after synovectomy have proved most gratifying, with an absence of the usual tendency for a large effusion to develop such as occurs when elastic bandage compression is used postoperatively. The pneumatic splint has kept the effusion to a minimum, while permitting early motion and ambulation. An inter-

esting comparison was that of results after a synovectomy of the right knee that was treated postoperatively with the air splint, and a simultaneous synovectomy of the left knee, in the same patient, treated by the elastic compression dressing because an air splint was not available. In the right knee only a trace of effusion developed; while in the left knee an estimated 40 ml. of effusion accumulated. After three months the results were the same in each leg, with a full range of motion and no effusion, but aggressive mobilization was initiated on the air-splinted leg two weeks earlier than on the other leg.

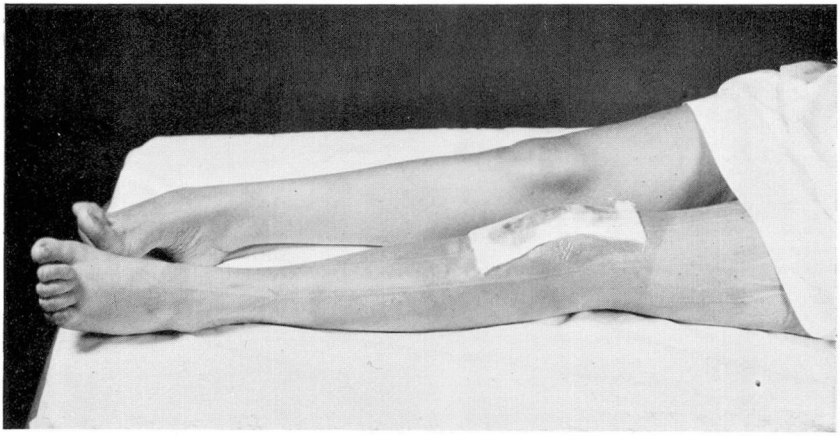

Fig. 2. The same leg as that shown in *Figure 1*, immediately after removing the splint 72 hours postoperatively.

The splint is now made of extremely thin pliable plastic, because the thicker plastic splints used earlier had caused bleb formation resulting from the tenting effect of the wrinkled plastic when in contact with the bare skin. Sweating beneath the air splint has not been troublesome. We found tiny bleb formations in two patients, which cleared soon after discontinuation of the splint at 48 hours. One patient had a partial thickness skin slough on the posterior aspect of the thigh. In this case the patient lay on a fold of the splint posteriorly, which caused a pressure slough. One patient, who underwent the excision of a Baker's cyst, had a postoperative wound infection that in no way could be related to the use of this splint.

Summary

The inflatable plastic air splint has been used as a postoperative compression wound dressing on the knee after operations in 26 patients. The splint failed to hold air pressure in two instances; the cause of air loss is believed to have been corrected by a new valve now used. Postoperative effusion was believed to be well controlled, or prevented, in each instance. This air splint as a postoperative dressing is superior to the dressings in common usage for knee operations.

Reference

1. Gardner, W. J.: Inflatable emergency dressing. Cleveland Clin. Quart. **29:** 54-56, 1962.