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A New Orthosis for Fixation of the Cervical Spine—Fronto-Occipito-Zygomatic Orthosis

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INTRODUCTION

Most of the cervical orthoses for long-term fixation due to cervical spinal injury and other disorders, the Halo orthosis excluded, not only restrict the mouth movement to speak and to eat, but also give insufficient fixation against rotation because they have the fixing points on the mandibular occiput and body. A cervical orthosis was devised which does not fix on the mandible, to allow the mandible to move freely and which stabilizes the head by supports fixing on the frontal bone, occipital bone, and both the zygomatic bones and connecting to the trunk. The orthosis has been used for many patients with cervical diseases and has received favorable comment in our clinic since it is easily handled and provides excellent fixation.

FEATURES AND MERITS OF THE ORTHOSIS

If a patient in our clinic with a cervical spine disorder requires a non-invasive brace for firm fixation, the Fronto-Occipito-Zygomatic Orthosis—abbreviated as FOZY Orthosis hereinafter (Figures 1 and 2)—is considered to be the best orthosis of various cervical supports due to the following advantages.

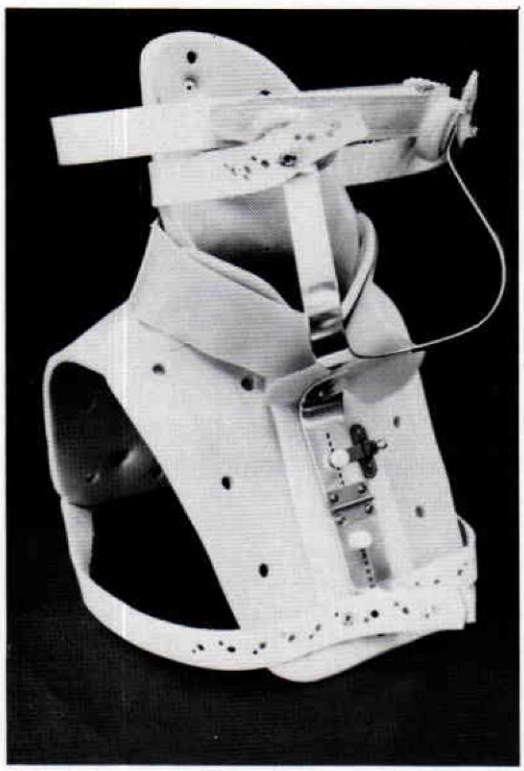

Figure 1. The FOZY Orthosis.

The FOZY Orthosis can limit the movement of the cervical spine in all directions, including rotation of the upper cervical spine, and therefore can be used for pa-

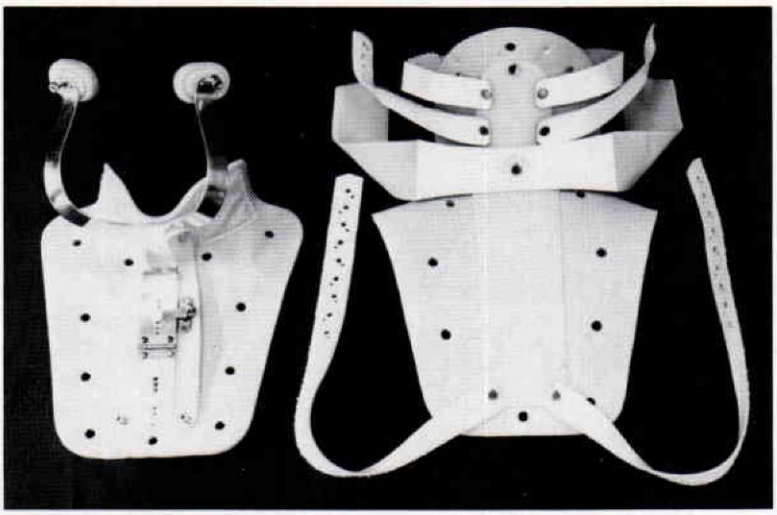

Figure 2. The anterior and the posterior parts.

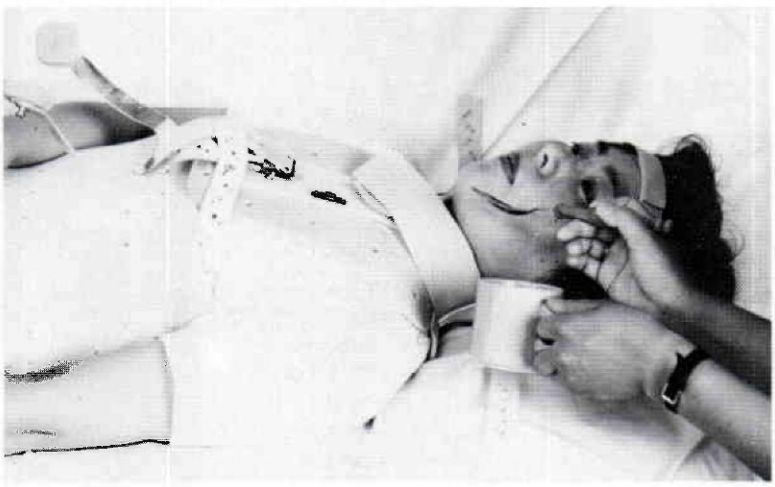

Figure 3. Taking a meal in a supine position.

tients with diseases affecting the upper cervical spine. As this orthosis has the fixing points on the frontal bone, occipital bone, and zygomatic bones, the mandibular bone has no limitation. The anterior part of the Superplast® support is cut short so the mouth can open freely to speak and eat.

The orthosis can be put on and off in the supine position so easily that it is adequately applied to patients with cervical spinal injuries. The support for the zygomatic bones can be adjusted to an adequate angle and be removed, depending on the patient's conditions, by use of a hinge and a screw (Figures 4 and 5).

For patients after the acute stage, it can be used as an orthosis similar to the Philadelphia type. It is light, easy to don and doff, and can be easily fabricated.

When putting it on a normal adult, the residual movable range is about ten degrees in every direction (In nodding action, the upper cervical spine has a limited motion within ten degrees only). The FOZY Orthosis is useful for long-term fixation after treatment with Halo-Pelvic or Halo-Jacket traction, and it is also widely applied for fixation of the middle and lower cevical spine. It is also useful after anterior fusion of the cervical spine.

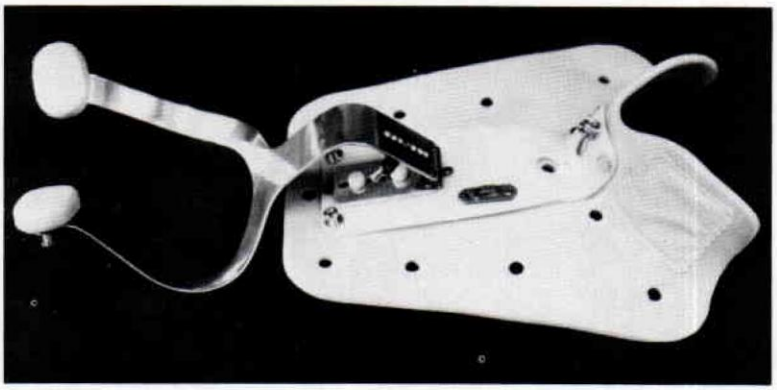

Figure 4. Adjusting the angle of the zygomatic support.

Figure 5. Removal of the zygomatic support.

DESIGN OF THE FOZY ORTHOSIS

The FOZY Orthosis consists of a firm cervical support provided with a Y-shaped support for both zygomatic bones and circumferential belts for the anterior head fixation. The orthosis is composed of two parts: an anterior part that fixes on the cheeks and the anterior thorax (Figure 8); and a posterior part that fixes the posterior head, the neck and dorsal surface of the body (Figure 9). The surface against the skin of both parts is covered with Superplast® of 6-10mm thickness and the supporting stem along the median line of the body is made of thermoplastic Subalsorene® of 3-4mm thickness. A Y-shaped cheek supporting plate made of light alloy (duraluminum plate of 2mm thickness) is attached to the front stem, and cheek pads are applied to its top. This supporting plate is adjustable to change the angle and height of the pads. It also has a hinge and screw to allow easy removal. The posterior part has four pairs of Velcro® straps; head belts support the anterior cranium; zygomatic belts are connected to the cheek supports; shoulder belts fasten the clavicular region and chest belts connect the sternal piece of the anterior portion. Its total weight is only 450 grams.

It is preferable to fabricate the orthosis over a positive plaster model of the patient. If modeling is impossible in an acute stage, it can be made based on the circumference measurements of head, neck, and chest, and on the distance between both cheeks.

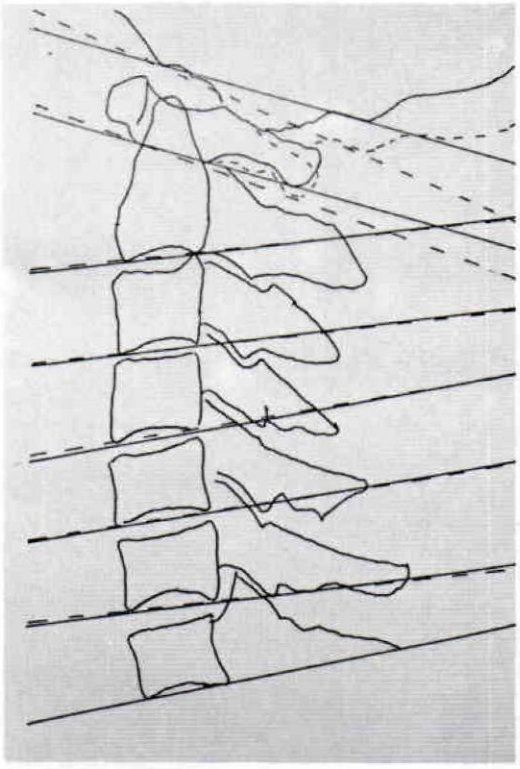

Figure 6. A sketch of an X-ray picture of vertebrae after application of the FOZY Orthosis to a normal adult. The solid line represents flexion and the dotted line represents extension. It shows that large movement is well controlled but upper cervical vertebrae remain able to move 5-10 degrees.

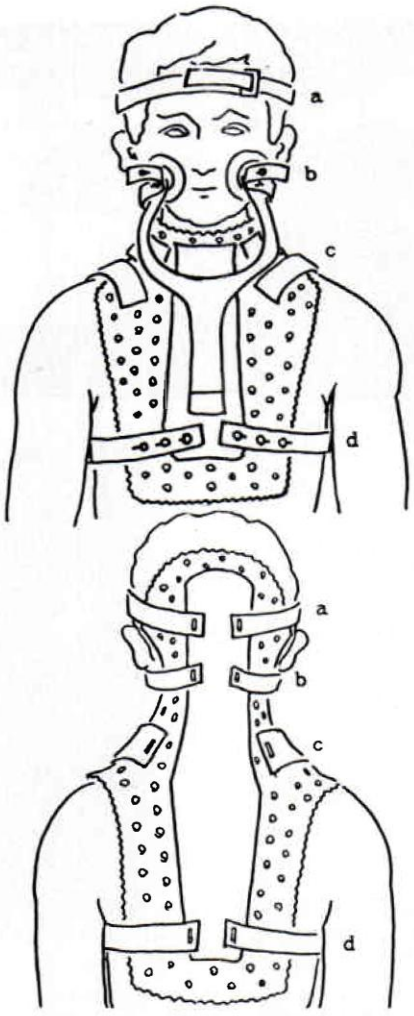

Figure 7. The anterior and the posterior views of the FOZY Orthosis.

CLINICAL EXPERIENCE AND INDICATIONS

The FOZY orthoses were fitted to 48 patients with cervical spine involvement. They were used in the conservative treatment of Hangman's fracture, dental process fracture of the axis, vertebral arch fracture and injuries of the intervertebral disc with spinal paresis in seven cases. They were also used for fixation after the anterior fusion for cervical subluxation and fracture, spinal cord injuries and cervical spondylosis in 27 cases, as well as for one-side opening spinal canal enlargements and for patients with cervical spinal canal stenosis in 14 cases.

The patients consisted of 39 males and nine females, including one child younger than ten years old. The average age was 52.1 years. The subjective vertebrae of FOZY Orthosis application were from the atlas to the second thoracic vertebrae and the application period was from one to three months. During this period, the patients were subjected to mat, standing, and ambulation training. Thus, rehabilitation for patients with cervical spine injuries could be actively progressed. Of the 48 participants, no cases had increased injury

Figure 8. The anterior portion.

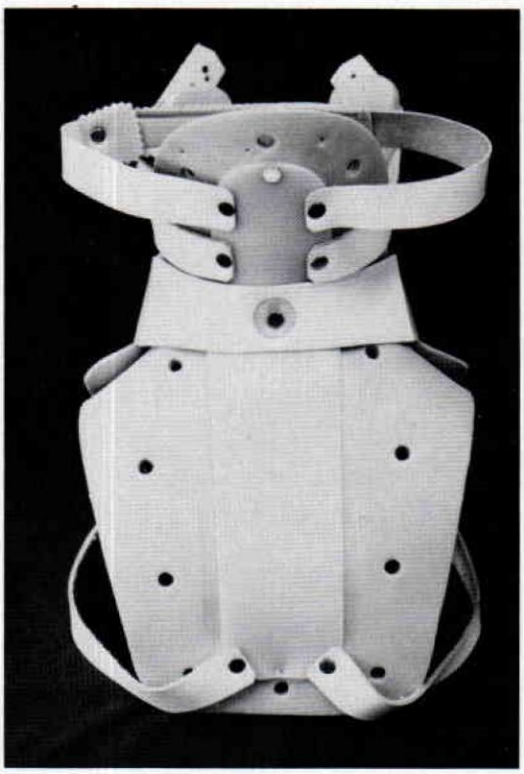

Figure 9. The posterior portion.

to the cervical spine or dislocation of grafted bone in the period of orthosis attachment. After discontinuing the orthosis, the range of cervical motion was almost normal, except for the patients with vertebral enlargement.

SUMMARY

Though the upper cervical vertebrae can move in five to to ten degrees merely to nod, the FOZY Orthosis can fix the cervical spine in every direction, including rotation, and also firmly limit the movement of the upper cervical spine. It can thus be applied to many diseases of the upper cervical spine, to cervical spinal injuries in an acute stage, and for external fixation after anterior spinal fusion. Since it is easily handled and light, early rehabilitation can be performed actively.

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