

Case Report

Dynamic Orthosis for the Entire Spine

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Received: 05 March 2020; **Accepted:** 16 March 2020; **Published:** 30 March 2020

Citation: Herman J Traven. Dynamic Orthosis for the Entire Spine. Journal of Spine Research and Surgery 2 (2020): 017-022.

Keywords: Spine Injuries; Orthosis; Spine; Dynamic Immobilization

1. Introduction

To date, accidents and injuries have reached epidemic proportions. In polytrauma, individual segments of the spine are often affected. At that time, the emergency physician must determine whether the spinal injury is stable or unstable. This is followed by surgical or conservative therapy. The old realisation that in fractures require the immobilisation of the affected bone and the two adjacent joints, unless osteosynthesis has been performed, has been well-established. Massages are forbidden. I observed that in the case of stable spinal injuries, segmental orthosis is administered in practice, because there is no suitable dynamic apparatus for the necessary immobilisation of the entire spine. However, doing so neglects the facts that the spine is a biomechanical chain joint, which can be divided into

segments only anatomically, and not physiologically. An injury of one segment affects the statics of the entire spine. Although the osteosynthesis of vertebrae or implantation achieves a relatively stable consolidation, many problems may occur in the postoperative period, outside the knowledge of the surgeon, due to premature mobilization. I offer a solution to surgeons in the accompanying article. I myself have carried out a medical survey of a support apparatus that I developed in a critical situation at a certain point in time [1-8].

2. Medical Case

A 46-year-old man of asthenic constitution fell backwards from the height of 4 metres while working in the garden due to a break in the side of a wooden ladder. He fell on two parallel 5 cm thick concrete curbs and hit his cervical and lumbar spine segments. A head injury did not occur. Due to the impact to his neck, he experienced forceful paraesthesia lasting several

seconds in all extremities, as characteristic of an electric shock with several thousand Volts. Fully conscious without dyspnoea he realised that his lungs are not being ventilated, i. e. he was not breathing. Therefore, he moved and fell a further ten centimeters down. Now he could breathe in air. When he recovered and because the pain was still tolerable, he quickly ran, bent forwards, to the 15 m remote living room and lay on wood floors for 4 days in home care. The first week he took diazepam, chlorzoxason/paracetamol.

The strong hardening of the abdominal muscle (defansé) loosened after three days. On the fourth day he was taken on a stretcher to the Orthopaedic Clinic. An X-ray investigation found injury of the C6, 7 Th5, and L1, 2 vertebrae. Because the injuries of the vertebrae appeared stable, a plaster corset with a Minerva cast was indicated. The patient decided against hospitalisation because with the help of the plaster immobilisation he became partially mobile. At home, the plaster deformed in the lying down position due to summer heat and sweating. Paresthesia of the lower extremities appeared. Therefore, we removed his 7, 5 kg heavy plaster 9 days after the injury and replaced it with an innovative prototype of a dynamic support device for the entire spine. The biggest challenge then was to exactly form the sinusoid curves on the brace. The patient was able to

walk to the restroom. In the standing position, the brace also relieves the gravitational pressures. Three weeks after the injury; during a shorter drive with the city bus, the patient had to stand on his toes due to painful vertical jolts. After four weeks of 24 hours a day use of the device a rigidity of the spine was detected. In the fifth week, progressive phasing out of the orthosis followed, and then 14 days everyday the patient received physiotherapy in a warm sea water pool. Half a year after the accident unpleasant neuralgic pain was occasionally present in the right dermatome C8. It has now been 30 years from this event. The injured man is 77 years old and has stated that he has had no problems with his spine. He was performing various physical work, but he did not do sports.

3. Characteristics

The orthosis is a 2, 30 kg heavy apparatus consisting of:

A: a dorsal metal support, extending from the back of the neck to the sacral bone.

B: a thoracic + abdominal pelot

C: a Shanz kravats.

The construction enables the regulation of the individual components with each other within a length of 4 cm.

This solves the issue of serial production in the sizes S, L, X, XL, as a kit.



Figure 1: Frontal view.



Figure 2: Dorsal view.



Figure 3: View from the left.



Figure 4: View from the right.

4. Application

In the abdominal position of the patient, the sinusoid curves of the spine are copied by means of a handy universal stencil. The dedicated tools are then used to accurately form the dorsal longitudinal metal strip. A 3D scan is not required. The so-called Shanz kravats can be individually adjusted in volume. A removable piece is integrated into the underchin that can be removed prior to eating to allow for the chewing of food. Perspiration of the cervical area is guaranteed.

- The armpit pads affect the muscle tone of the shoulder ring.
- The pressure of the brace on the spinous processes is neutralised with the surrounding area.
- In the lying down position, the brace easily dips into the bed mattress.
- The redressing of metal strips is always possible due to the internal elasticity of the aluminium alloy.

Each case of application is formed strictly individually post-injury or prior to surgery. The indication is determined by the surgeon. The mental stability of the injured person is also important. In post-surgical convalescence, this method restricts unwanted bending between vertebrae along the entire spine, which are subsequently often the cause of insufficient restitution *ad integrum*, even though a stable osteosynthesis was performed on time.

5. Material

1. Straps-(aluminium alloy with appropriate internal elasticity)-6 pcs
2. Plastazote
3. Stainless steel screws M6 with lens head(hex key system)-6 pcs

4. Detachable three-part Shanz kravats(Velcro system)
5. Tensioning metal spring clips(4 pcs)
6. Pull straps(4 pcs)
7. Plastics and aluminium pellets(5pcs)
8. Two plastazote axillary pads
9. Glue
10. Rivets

6. Discussion

A phobia of this kind of immobilisation is redundant. Also due to the public exposure in domestic care. The original purpose was to allow the professional immobilisation of the injured spine in the hospital with the aim of the patient continuing their treatment in domestic and outpatient care. Further research on the importance of the correct immobilisation of this biomechanical chain joint will confirm the importance of the correct post-traumatic easing of stretched tissues due to the sudden effects of physical force. The formation of individual sinusoid forms from case to case is made possible with dental-technical accuracy. If necessary, appropriate redressing is possible if the treatment lasts for a longer time. I note that after injuries, there is an exaggerated push for premature inclusion of mobilisation and such offers. The injury must be treated properly and in line with the doctrine. Analgesics are not recommended. Extensions of the indications for this type of orthosis have not been investigated. By extensions I mean juvenile scoliosis, osteoporosis fractures, broom-shaped fractures of vertebrae due to blast effects on pilot of jets, soldiers, etc.

7. Conclusion

For establishment in practice, the consensus of experts of the profession and other important stakeholders is necessary, with the aim of not harming the affected.

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