

SPINAL ORTHOTICS WITHIN CUSTOM SEATING?

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INTRODUCTION

Over 30,000 Matrix seating orthoses (Foort, et al, 1978, Cousins, et al, 1982, Cooper, et al, 1983) have been fitted worldwide in the last 25 years. Following a major re-design eight years ago (Cousins & Clarke, 2006) the treatment options and the client groups who could benefit have broadened. This is a preliminary report on some of the clinical options possible with this new technology.

The design improvements (two segments: '4-ball' and 'clamp' units with lockable ball and socket joints) have allowed exploration in two new directions: (1) accurate and controlled 3D shaping directly on the client by rotating the clamp in and out from the body, and, (2), with stronger clamps and new reinforcement technology (heat reformable carbon/glass fibre), integral flexible components can be fitted as needed within the orthosis. This last improvement has allowed the development of the 'door' technique using integral flexible 4-balls (soft, medium, hard) to create complex multi-axis hinging zones that can apply biomechanically effective three point spinal corrective forces within the seating orthosis.

In addition to these hardware changes new fitting techniques have been developed to reduce delivery times whilst improving quality of fit and, with the 'door', the correction and prevention of deformity not possible before (reported in Trail and Galasko, 1990).

PATIENTS AND METHODS

Subjects and Diagnoses: 32 patients were fitted, 29 in Sweden and three in England (24 full seats, eight backs) diagnosed with Cerebral Palsy (CP), Muscular Dystrophy, Spinal Muscle Atrophy and Brain Injury (BI).

Procedures: Figure 1 partly summarises the decision making process for spinal deformity in the Medial-Lateral and Anterior-Posterior planes and 3D combinations of these.

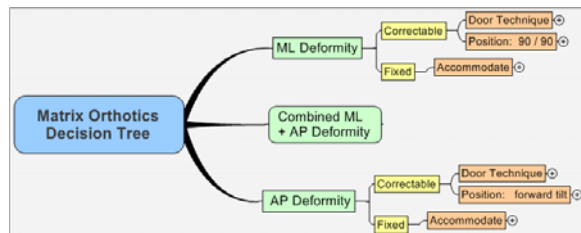


Figure 1. Part of the treatment decision tree for using re-designed Matrix components.

Fitting Methods: All 32 patients were initially either fitted directly or indirectly. If directly, they were supported on the Matrix during the shaping process or if indirectly, the Matrix was fitted over a cast taken

from an evacuated beanbag. A combination method has been used (but not for this series of patients) using a beanbag cushion onto which the Matrix sheet is formed (not locked) with the back shaped directly. All patients had an intermediate fit (interfit) in the Matrix shell (full body seat) before completion of the orthosis. More than one interfit was required to obtain a successful fit. Carbon fibre reinforcement was used where rigidity was needed ('door' strap mount).

Measurements: Measurements were taken on some patients using a Pulse Oximeter (part of the patient's risk management) for absolute measure of blood O₂ saturation and as a relative check on the tightness of the 'door' closing strap. A pressure mapping system (1296 sensors) was used to measure the amount of vertical unloading obtained and to analyse the pressure distribution pattern before and after closing the 'door'.

DISCUSSION AND RESULTS

Multiple interfits, where the orthotist can see and feel through the orthosis guarantees an excellent fit (bad fit can be seen directly). Some other benefits included: spinal correction with seat pressure reduction, vertebral column elongation, corrective forces distributed over large areas, corrective forces can be applied over the hip and along the thighs (unlike a spinal jacket). The relationship of Cobb angle to 'door' hinge zone angle and relative position to centreline of the orthosis was determined and can be used as a fabrication guide. Patient compliance and, in long term care facilities, training of staff applying the seating orthosis is very important.

30 out of the 32 patients were successful: one patient (BI) making a dramatic recovery, one (CP) compliance failure because of low cognitive ability.

CONCLUSION

A new technique has been described that combines orthotic correction integral to a custom made seat. In this preliminary study 30 out of 32 patients found this approach successful.

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