

Original Article

A specialist seating assessment clinic: changing pressure relief practice

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Study design: Description of a clinical service, evaluation of pressure relief practices.

Objectives: To describe a specialist seating assessment clinic and a change in clinical practice arising from its work.

Setting: National Spinal Injuries Centre, Stoke Mandeville Hospital, UK.

Methods: Retrospective review of the ischial transcutaneous oxygen measurements of 50 newly injured and chronic spinal cord-injured (SCI) individuals seen in a specialist seating assessment clinic. Tissue oxygenation was measured in the sitting position (loaded) and during pressure relief (unloaded).

Results: Mean duration of pressure relief required to raise tissue oxygen to unloaded levels was 1 min 51 s (range 42 s—3 min 30 s).

Conclusion: These results confirmed the clinical perception that brief pressure lifts of 15–30 s are ineffective in raising transcutaneous oxygen tension (TcPO₂) to the unloaded level for most individuals. Sustaining the traditional pressure relief by lifting up from the seat for the necessary extended duration is neither practical nor desirable for the majority of clients. It was found that alternative methods of pressure relief were more easily sustainable and very efficient.

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Keywords: rehabilitation; pressure ulcer prevention; pressure relief; posture; seating assessment

Introduction

The majority of wheelchair users in the UK are elderly people over the age of 60 years whose impaired mobility arises from conditions such as neuromuscular or musculoskeletal disease, chronic lung or heart disease. Their main requirement is for a simple push or self-propel chair, which is often used outside the home only. In contrast, spinal cord-injured (SCI) individuals comprise only 1.3% of the wheelchair-using population in the UK,¹ but they depend entirely on the wheelchair for their mobility, and as active users they require sophisticated, high-performance wheelchairs that enhance remaining independence.

For such users, it is essential that the seating system – chair, cushion and any accessories – should actively contribute towards quality of life by maximising remaining physical function and enhancing psychological and social well-being. An effective seating system can contribute to these goals by promoting tissue viability, a balanced, symmetrical posture and optimal mobility and function. Owing to the complexity of the needs of many SCI individuals, these clients need to be assessed in specialist seating clinics where a holistic approach, with

an emphasis on the education of clients and carers, can ensure that the most suitable equipment is provided for each individual. The cost of effective, holistic seating can be considerable: a lightweight chair will cost upwards of £1200 and ‘high-risk’ cushions £300–£400. However, when compared with the high cost of treating pressure sores,² which are frequently associated with poor seating in this population, the provision of suitable and effective seating can be seen as cost effective.

This paper describes the development of a specialist seating assessment clinic at the National Spinal Injuries Centre, Stoke Mandeville Hospital NHS Trust, and a change in clinical practice arising from its activities.

Background

Pressure sores have a multifactorial aetiology³ and despite the education offered to SCI individuals and their carers during rehabilitation, and the development of increasingly sophisticated pressure relief devices, they remain a common complication of both acute and chronic spinal cord injury.^{4,5} The risk of pressure sores in the SCI population is much greater than in the general population; 15 major risk factors and in excess of 50 additional risk factors have been identified for

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pressure sores after SCI.⁶ Financial costs to the health service in the treatment of pressure sores are high,² and the social, psychological and financial costs to the client and his family are not inconsiderable.

Seating clinics were first developed in the USA⁷ in the mid-1970s with the aim of reducing the incidence of pressure sores in the SCI population and other clinics have since been reported based largely on this early work.^{8,9} Such clinics have been reported to reduce dramatically the recurrence of pressure sores in the spinal-injured population.^{10,11}

Reports on seating clinics usually describe the use of interface pressure measurement combined with professional assessment skills to prescribe suitable pressure relief cushions and sometimes wheelchairs. Research undertaken at the NSIC in the 1990s¹² suggested that interface pressure measurement alone was not sufficient to identify areas of tissue at risk of pressure damage. The measurement of transcutaneous oxygen tension (TcPO₂) as an indicator of tissue viability was therefore included in the development of a comprehensive assessment protocol.

The seating clinic at the NSIC

Initially established to address the needs of newly injured individuals, the clinic has expanded to include the assessment of chronic SCI individuals referred both from within the unit and from the community. For newly injured individuals, the aim of the clinic is to promote optimal posture and function, and prevent the development of pressure sores and postural deformity. These individuals are seen within 4 weeks of initial mobilisation and at least once more prior to discharge, depending on their needs. For individuals with a chronic SCI, the aim of the assessment may be to correct or arrest the development of postural deformity, change the configuration of existing equipment or recommend alternative equipment to accommodate alterations in function due to age or other causes, and to reassess the whole seating system following the development and treatment of pressure sores. For either client group, the clinic plays an important role in education. The clinic also has an important educational role for staff. Unit staff and basic and post-basic healthcare students are encouraged to attend the clinic with their patients.

Assessments are carried out by a team of physiotherapists and occupational therapists, and nursing support is provided through the spinal outpatient services when required. This multidisciplinary skill mix promotes a holistic approach to the assessment of the client's needs.

The seating assessment

During an assessment, the posture, function and tissue viability of the wheelchair user are systematically assessed in the seating system used at the time, following a comprehensive protocol.

Posture is first assessed in the patient's habitual posture in the wheelchair. The alignment of trunk, head

and lower limbs are documented in relation to the position of the pelvis in both anterior, posterior and lateral views. The adjustable parts of the wheelchair, that is, foot and armrests, are checked for correct positioning. Any abnormal posture is checked for correctability. This may be done either seated in the wheelchair or lying in the supine position.

The function of the user at the time of the assessment is documented with regard to ability to propel the wheelchair and method of transfer as well as general comfort. This information is related to the current seating system and to the projected outcomes of rehabilitation. The general fit of both wheelchair and cushion are also checked.

During the assessment, the general attitude and expectations of the patient towards their current and future seating systems are noted, and will influence the final recommendations.

Tissue viability is assessed through visual inspection of the skin over the seating area and the measurement of tissue oxygen levels and interface pressure levels and distribution. During the seating assessment, TcPO₂ is continuously monitored over one ischial tuberosity in both unloaded and loaded positions. On arrival for an assessment, the patient transfers to a bed. With the patient in a side-lying position with hips and knees flexed to 90°, the ischial tuberosity is palpated and the TcPO₂ electrode (Radiometer, Copenhagen) is applied.¹³ The electrode heats the skin to 43°C to promote maximal vasodilation, when TcPO₂ has been shown to be equal to arterial oxygen tension.¹⁴ The client remains in the side-lying position for a short period while a stable reading of TcPO₂ without external pressure (unloaded) is obtained. This reading provides a baseline against which to evaluate the effectiveness of pressure relief. While the client is on the bed, a visual inspection of the skin over the seating area is conducted. Tissue damage, redness or discolouration, bruising and scarring are noted if present and are discussed with the client. A hand mirror is used to enable the client to see the skin over the seating area during the assessment. In discussion with the client, the causes of skin blemishes are identified, where possible, so that further damage can be avoided. The client returns to his seating system with the electrode remaining over the ischial tuberosity (loaded) and monitoring continues. When a stable, loaded reading is obtained, pressure relief activities are conducted. Pressure relief is deemed to be effective when TcPO₂ levels have recovered to the unloaded level previously recorded. This technique has enabled the evaluation of various pressure relief techniques for each individual. The clear display of tissue oxygen readings during sitting and pressure relief provides vivid feedback to the client and carer of the effect of pressure on tissue oxygen availability and the effectiveness of pressure relief.

Pressures at the interface between the body and the cushion are measured during the seated part of the assessment using a pneumatic system (Oxford Pressure Monitor, Talley Group Ltd) with a flexible, compliant

measurement pad. The system provides a dynamic visual display of the pressure distribution, as well as numerical pressure data, which allows the evaluation of the effectiveness of the cushion in distributing pressure evenly over the support surface, and away from bony prominences. The visual display enables the client and carer to appreciate the effect of posture on pressure distribution, emphasising the importance of giving due attention to posture in the chair and correct use of equipment. When equipment is prescribed, the choice should be matched to the patient's ability, motivation and lifestyle, and must be acceptable to the individual.

Throughout the assessment, the engagement of the client and carers with the assessment process is actively encouraged. The visual feedback from the interface pressure monitor and TcPO₂ monitor is available to the client throughout the assessment and is used by clinic staff to reinforce the need for vigilance regarding pressure relief and attention to posture.

Following the assessment, recommendations are made regarding the appropriate chair, cushion and other seating-related equipment, and pressure relief method and duration. A report is shared with all members of the multidisciplinary team and referring agencies.

Changing clinical practice

Our experience in the clinic suggests that the traditional pressure relief lift lasting 15–30 s is ineffective as a means of pressure relief as tissue oxygen levels are unable to recover to the unloaded level within this time. This perception was explored in the following small study.

Methodology

A small retrospective project was undertaken to review the initial assessments of 50 newly injured and chronic SCI individuals seen in the clinic for a full assessment. The following information was recorded: age, level of injury, Frankel Grade, unloaded TcPO₂ and duration of pressure relief required for loaded TcPO₂ to recover to unloaded levels. The records of four patients were excluded due to incomplete data.

Sample

The sample characteristics are shown in Table 1.

Findings

In a sample of 46 patients seen in the clinic, the mean duration of pressure relief required to raise tissue oxygen to unloaded levels was 1 min 51 s (range 42 s–3 min 30 s). These results confirmed the perception that brief pressure lifts of 15–30 s are ineffective in raising TcPO₂ to the unloaded level for each individual. Sustaining the traditional pressure relief by lifting up from the seat for the extended duration is neither practical nor desirable for the majority of clients due to strain on upper limb joints, and sometimes other constraining health condi-

Table 1 The sample

Age	Range 20–83 years, median 41 years
Duration of injury	Range 5 weeks–50 years, median 12 weeks
Level of injury	Cervical = 19 T1–6 = 9 T7–12 = 13 L1 and below = 4 Nontraumatic = 1
Frankel grade	A = 18 B = 5 C = 16 D = 2 N/K = 5
Gender	Females 13 Males 33

tions. However, we have found that alternative methods of pressure relief are more easily sustainable and very efficient, and where assistance with pressure relief is needed these methods require little effort on the part of carers. These findings have resulted in a change in clinical practice at the NSIC. Pressure relief is now carried out using one of the following methods.

Forward lean

Leaning forward with elbows or chest on knees, with or without assistance, effectively relieves pressure from the ischial tuberosities and requires no effort to maintain. Some independent patients also indicated that this was a less-obtrusive method of pressure relief than the traditional lift and was therefore more acceptable to them.

Side to side

For individuals unable to lean forward, leaning first to one side then the other is again effective in relieving pressure from the ischial tuberosities.

Tilt back

For a small group of individuals for whom these changes in position are unsuitable, for instance due to ventilator dependence or pain, tilting the whole seating unit back can relieve pressure sufficiently for TcPO₂ to rise. The degree of tilt required to provide effective pressure relief is 65° or greater.¹⁵ This can be achieved using a 'tilt in space' wheelchair or manually in other chairs. Where this method is conducted manually, it is recommended that the assistant is seated behind the patient.

Use of the TcPO₂ sensor allows identification of the precise duration of pressure relief most appropriate for each individual. The TcPO₂ sensor data and the functional ability and personal preferences of the individual all contribute to the selection of a pressure

Table 2 Method of pressure relief recommended, by level of injury

	<i>Lean side to side</i>	<i>Lean forward</i>	<i>Lift</i>	<i>Other</i>
Cervical	7	10	0	2
T1–6	3	5	1	0
T7–12	7	2	4	0
L1 and below	3	0	1	0
Nontraumatic	0	1	0	0
Total	20	18	6	2

relief method that is effective in maintaining tissue viability and is acceptable to the patient.

As illustrated in Table 2, leaning forward or to the side is now by far the most frequently recommended method of pressure relief. The traditional pressure lift was recommended for only 13% of this sample where recovery of TcPO₂ in response to pressure relief was particularly rapid and the individual was both sufficiently able and preferred this option. Other methods of pressure relief included ‘tilt back’ as described above. This method was used by a ventilator-dependent individual. This man was sensory incomplete and regular pressure relief enabled him to increase his time up in his chair by improving his level of comfort.

Conclusion

The seating clinic at the NSIC aims to provide a comprehensive and systematic assessment of the seating needs of patients and clients seen in the unit. The assessment provides therapists with objective evidence in support of recommendations to wheelchair services for equipment for SCI individuals. The ability of therapists to advocate on behalf of their client for the provision of specialist and sometimes expensive equipment is enhanced by comprehensive, objective assessment and documentation of their client’s needs through the clinic.

While seating clinics have been described previously in the literature, the use of tissue oxygen measurement as part of a seating assessment has not. This technique has proved valuable in identifying the limitations of the traditional method of pressure relief in the wheelchair, and has enabled the development of alternative pressure relief approaches. Furthermore, it allows recommendations for pressure relief activities to be individually

tailored for each client. The visual feedback the TcPO₂ monitor provides is also a valuable teaching tool for clients and their carers.

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