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Malignant spinal cord compression: prospective study of delays in referral and treatment

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Abstract

Objectives: To examine the delay in presentation, diagnosis, and treatment of malignant spinal cord compression and to define the effect of this delay on motor and bladder function at the time of treatment.

Design: Prospective study of all new patients presenting to a regional cancer centre with this condition.

Setting: Regional cancer centre.

Subjects: 301 consecutive patients.

Main outcome measures: Interval from onset of symptoms to presentation and treatment, delay at each stage of referral, and functional deterioration.

Results: The median (range) delay from onset of symptoms of spinal cord compression to treatment was 14 (0-840) days. Of the total delay, 3 (0-300) days were accounted for by patients, 3 (0-330) days by general practitioners, 4 (0-794) days by the district general hospital, and 0 (0-114) days by the treatment unit. Initial presentation to the regional cancer centre with symptoms of malignant spinal cord compression led to a significant reduction in delay to treatment and improved functional status at the time of treatment. Deterioration of motor or bladder function ≥ 1 grade occurred at the general practice stage in 28% (57) and 18% (36) of patients, the general hospital stage in 36% (83) and 29% (66), and the treatment unit stage in 6% (19) and 5% (15), respectively.

Conclusions: Unacceptable delay in diagnosis, investigation, and referral occurs in most patients with malignant spinal cord compression and results in preventable loss of function before treatment. Improvement in the outcome of such patients requires earlier diagnosis and treatment.

Introduction

Metastatic malignant spinal cord compression is a major cause of morbidity in patients with cancer and often renders a previously functioning patient bedridden or in hospital for the rest of his or her life.[1] The outcome of treatment is poor, with less than half of patients retaining or regaining the ability to walk and about two fifths requiring a permanent urinary catheter.[2 3] The most important prognostic factor for functional outcome is neurological function before treatment, with about 70% of initially ambulant patients, 30% of paraparetic patients, and 5% of paraplegic patients retaining or regaining the ability to walk.[2 4] In one review of 1392 patients, only 32% were ambulant at treatment.[4] Similarly 45% of patients

Table 1 Median (range; 95% confidence interval) number of days to treatment of patients with malignant spinal cord compression

Delay	All patients	With history of malignancy (n=196)	With no history of malignancy (n=105)	P value*
From onset of back pain	73.5 (3-1650; 60 to 89)	62 (3-1650; 47 to 84)	90 (4-570; 54 to 143)	0.0024
From onset of spinal cord compression	14 (0-840; 12 to 17)	13 (0-840; 9 to 15)	20 (1-30; 14 to 28)	0.0016
From onset of weakness	13.5 (0-840; 10 to 15)	10 (0-840; 8 to 14)	18 (0-360; 13 to 23)	0.0062
From loss of ambulation	4.0 (0-80; 3 to 4)	3 (0-80; 3 to 4)	4 (0-33; 2 to 9)	0.13

*History of malignancy v no history, Mann-Whitney U test.

Table 2 Median (range; 95% confidence interval) number of days of delay in presentation, referral, and treatment of patients with malignant spinal cord compression

Cause of delay	All patients	With history of malignancy	With no history of malignancy	P value*
Patient	3 (0-300; 2 to 4)	3 (0-30; 2 to 4)	4 (0-78; 2 to 7)	0.431
General practitioner	3 (0-330; 2 to 4)†	2 (0-210; 1 to 3)†	4 (0-330; 2 to 7)†	0.032
Hospice	3 (0-12; 0 to 8)	3 (0-12; 0 to 8)	0	NA
District general hospital	4 (0-794; 3 to 5)†	3 (0-794; 1 to 5)†	5 (0-70; 3 to 8)†	0.046
Treatment unit	0 (0-114; 0)†	0 (0-114; 0)†	0 (0-15; 0)†	0.20

NA = not applicable.
*Mann-Whitney U test.
†P<0.0001 Friedman test.

require a urinary catheter before treatment, and only 21% of these patients subsequently become catheter free compared with 79% of those who do not require a catheter before treatment.[2]

It is widely accepted that malignant spinal cord compression is a medical or surgical emergency, requiring urgent diagnosis and treatment because delay can result in irreversible paralysis or loss of sphincter function.[5 6] Many authors, however, have referred to unnecessary and preventable delay in its diagnosis and treatment.[7 8] While the common occurrence of severe neurological compromise at the time of treatment is well documented, the extent, cause, and effect of delay in referral and treatment are not and have therefore been investigated in the present study.

Patients and methods

I carried out a prospective study of 301 patients referred to the Clatterbridge Centre for Oncology (a regional cancer centre which is not part of a district general hospital) for treatment of a first episode of malignant spinal cord compression during a 3 year period. Six patients were excluded because it was impossible to verify most of the details of presentation and referral.

Patients were interviewed at the time of admission with a structured questionnaire, including details of the occurrence and time of onset of back pain, root pain, paraesthesia, weakness, and bladder dysfunction. The date the patient was first seen with back pain and with symptoms of spinal cord compression by the general practitioner, district general hospital, and the tertiary treatment unit (Clatterbridge Centre for Oncology or the Walton Centre for Neurosciences, Walton Hospital, Liverpool) was established by questioning the patient and cross checking with the hospital notes. Delays were expressed in terms of whole days, where a delay of <24 hour $= 0$ days, $\geq 24 < 48$ hours $= 1$ day, etc. Functional status when the patients were first seen by the general practitioner, district general hospital, and tertiary treatment centres and at the time of treatment was established in the same way and graded as follows:

Table 3 Numbers of patients delayed and extent of delay at each stage during referral

Delay (days)	General practitioner	Hospice	District general hospital	Treatment unit
0	62 (30)	3	50 (21)	202 (67)
1	19 (9)	1	37 (16)	38 (13)
2-7	58 (28)	3	68 (29)	43 (14)
8-14	21 (11)	2	34 (15)	12 (4)
>14	46 (22)	0	45 (19)	6 (2)
Not assessed	8	0	1	0

motor function—I no weakness, II weakness, walks unaided, III walks with aids only, IV paraparesis, unable to walk, V paraplegia; and bladder function—I normal, II sphincter dysfunction, III incontinence requiring catheter.

Data were analysed with STATISTICA FOR WINDOWS version 5.1 (Statsoft, Tulsa) and SPSS FOR WINDOWS version 6.0 (SPSS, Chicago). The distributions of delays were strongly skewed, and the median is therefore used throughout at the summary statistic with 95% confidence intervals calculated by the binominal method.[9] Two independent samples were compared with the Mann-Whitney U test, k related samples with the Friedman two way analysis of variance by ranks, k independent samples with the Kruskal-Wallis one way analysis of variance, and proportions with χ^2 test.[10]

Results

Table 1 shows the delay from the onset of symptoms to treatment for all patients and for those with and without a history of malignancy. In the latter group the diagnosis of malignancy was established at the time of presentation with malignant spinal cord compression. The delay from onset of symptoms to treatment was significantly longer for patients without a history of malignancy.

Patients first presented with symptoms of spinal cord compression to the general practitioner in 205 (68%) cases, to a hospice in four (1%), to a district general hospital in 64 (21%), and to the regional oncology centre in 28 (9%). During the referral process 214 (78%) patients were seem at some stage by a general

practitioner, nine (3%) at a hospice, 235 (78%) at a district general hospital, and all 301 at the regional oncology centre. The delay from first being seen by a doctor with symptoms of spinal cord compression to treatment was shorter if the patient first presented to the oncology centre rather than to the general practitioner or district general hospital (oncology centre delay 1 (95% confidence interval 0 to 1; range 0-114) day; general practitioner delay 9 (7 to 13; 0-840) days; district general hospital delay 6 (3 to 9; 0-74) days; $P = 0.0007$).

The delays during referral once the patient developed signs or symptoms of spinal cord compression are shown in table 2. Table 3 shows that of patients seen by general practitioners, 30% were referred without delay; of those seen by the district general hospital, 21% were referred without delay, and 67% were treated without delay at the treatment units. Delays of more than 7 days occurred in 33% of patients at the general practitioner stage, 34% at the district general hospital stage, and 6% at the treatment unit stage.

The functional status at each stage in the referral process and the number of patients who deteriorated ⩾ 1 grade at each stage is shown in table 4. Initial presentation to the regional cancer centre with symptoms of spinal cord compression was associated with an increased proportion who remained ambulant at the time of treatment (68% (19/28) v 30% (60/205) if they presented to a general practitioner and 28% (18/63) if they presented to the district general hospital, χ^2 17.2; $P < 0.001$). Similarly, 74% (20/27) of patients first presenting to the regional cancer centre were catheter free at treatment compared with 52% (101/195) presenting to the general practitioner and 48% (30/63) presenting to the district general hospital (χ^2 9.5; $P < 0.01$).

Discussion

This study has shown that delay in the diagnosis and treatment of malignant spinal cord compression remains a common problem and results in preventable deterioration in neurological function before treatment in most patients. Only 33% of patients were still ambulant and 53% catheter free at the time of treatment. This suggests little progress from the series reviewed by Findlay (originally reported between 1963 and 1982), in which 32% of patients were ambulant at treatment.[4]

Though malignant spinal cord compression is widely recognised to be a medical emergency, the precise degree of urgency required remains uncertain, and this may contribute to the occurrence of unnecessary delays. In general it is reasonable to expect referral and

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> ### Key messages
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> - Functional outcome of malignant spinal cord compression depends on functional status at time of treatment
> - Delay is associated with loss of motor and bladder function, which may be irreversible
> - Unacceptable delay in diagnosis and referral is common
> - The main causes of delay are failure to diagnose spinal cord compression and failure to investigate and refer urgently (within 24 hours)
> - Encouraging patients to present directly to a regional cancer centre may reduce delay and improve functional status at treatment

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treatment of malignant spinal cord compression in less than 24 hours,[11] but this target was not achieved in this study for 70% of patients at the general practitioner stage, 79% at the district general hospital stage, and 33% at the treatment unit stage. Failure to diagnose spinal cord compression and failure to investigate, refer, and treat sufficiently urgently were the main causes of delay and the consequent functional deterioration.

The finding that initial presentation directly to the oncology centre is associated with reduced delay to treatment and improved neurological function before treatment suggests that encouragement of increased self referral by the patient to the oncology centre might be one solution to the problem, at least for those already under the care of the centre. Given that this is a complication that occurs in only 1-2% of patients with cancer it would be preferable to target patient education to those groups at high risk (for example, those with breast and prostate cancer with bone metastases, myeloma). Facilitating early referral from general practitioners and district general hospitals to radiotherapy and neurological centres is important,[8] and after a preliminary analysis of the delays occurring at the Clatterbridge centre beds are now set aside to facilitate the emergency admission of patients with malignant spinal cord compression. The most important need, however, is for ongoing education to encourage clinical colleagues in all disciplines to recognise the early signs and the need for urgent referral.

Table 4 Deterioration in function during referral in patients with malignant spinal cord compression

	Motor function		Bladder function	
Stage	No (%) ambulant	No (%) deteriorating ⩾ 1 grade	No (%) catheter free	No (%) deteriorating ⩾ 1 grade
General practice	149/213 (70)	57/213 (28)	184/205 (90)	36/205 (18)
District general hospital	131/233 (56)	83/233 (36)	178/228 (78)	66/228 (29)
Treatment unit	109/299 (36)	19/299 (6)	164/289 (57)	15/289 (5)
Treatment	99/299 (33)	NA	152/284 (52)	NA
χ^2		56.3		54.3
P value		<0.001		<0.001

NA = not applicable.

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Reactions of participants to the results of a randomised controlled trial: exploratory study

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Abstract

Objectives: To assess views of parents of babies who participated in a neonatal trial, about feedback of trial results.

Design: Qualitative analysis of interviews.

Setting: Parents' homes.

Subjects: Parents of 24 surviving babies enrolled in a UK randomised controlled trial comparing ventilatory support by extracorporeal membrane oxygenation with conventional management.

Main outcome measures: Views about contents of results, reactions to results, effect of hindsight, and importance of feedback.

Results: Information about mortality was well understood by the parents but morbidity was less clearly reported. Even when the content was emotionally exacting, the information was still wanted as it removed uncertainty; provided an endpoint to difficult events; promoted further discussion within couples; and acknowledged their contribution to answering an important clinical question.

Conclusions: Feedback of trial results to participants should be a consideration of researchers, but a careful approach is required. This study was based on a highly selective group of parents within a particularly sensitive trial. More research is needed to assess the extent to which these results can be generalised to other trials or to groups such as bereaved parents.

Introduction

In recent years there has been a demand for the feedback of results of medical research to participants.[1-5] There are, however, practical and ethical factors to consider as results can be complicated, alarming, and distressing. Two studies examined participants' responses to results in sensitive situations where the results could induce feelings of guilt or fear.[6 7]

Epidemiological research into risk factors for paediatric brain tumours indicated an association with parental behaviour or lifestyle, or both.[6] Despite concerns about the impact on parents a questionnaire based study showed that mothers said that they understood the results and viewed feedback as important. The authors concluded that feedback was not emotionally exacting, but a poor response rate undermined the validity of their findings.

When treatment is randomised feedback may be particularly problematic. While randomisation is appropriate at the start of a trial at closure uncertainty should (ideally) be resolved. Trial participants who did not receive what was shown to be the best treatment may with hindsight feel deprived or placed at risk. In a trial of surgery to lower cholesterol after myocardial infarction, where mortality was higher in the control group, a quality of life assessment showed no detrimental effects of feedback.[7]

Although these studies suggest that feedback of sensitive results is not problematic closer examination is needed. Our study describes the reactions of a sample of parents of surviving babies to the communication of results of a neonatal trial.

United Kingdom collaborative trial of extracorporeal membrane oxygenation

The trial compared two methods of ventilatory support for critically ill neonates with acute respiratory failure. At randomisation the babies were already receiving ventilatory support by conventional management in a neonatal intensive care unit. Conventional management was compared with oxygenation of the blood by an external circuit (extracorporeal membrane oxygenation) in one of five specialist centres. Neonatal extracorporeal membrane oxygenation was only available in the trial as it was an unevaluated treatment.

The trial showed that extracorporeal membrane oxygenation reduces the risk of early death; 30 of 93 babies allocated to extracorporeal membrane oxygenation died compared with 54 of 92 babies allocated to conventional management.[8] Only one baby in each treatment group was found to have a severe disability at 1 year old.[9]

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