Dental assessment prior to stem cell transplant: treatment need and barriers to care

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IN BRIEF

- Provides an introduction to the use of haematopoietic stem cell transplants in the management of patients with haematological malignancies.
- Describes the RCS guidelines for the oral care of these patients.
- Outlines the aims of pre-transplant dental assessment and treatment.
- Highlights the issues affecting the provision of dental care in these patients and the role of special care dentists in their treatment.

Objective To assess the treatment needs of patients undergoing pre-haematopoietic stem cell transplant (HSCT) dental assessment, to collate the examination findings and treatment provided and to define the management issues impacting on care. **Design** Single centre retrospective analysis. **Setting** Salaried Primary Care Dental Service, Western General Hospital, Edinburgh, UK. **Subjects and methods** One hundred and sixteen available charts of patients who attended for pre-transplant dental assessment during April 2004–June 2007 were examined. **Results** Ninety-four patients, 52 men (55.3%) and 42 women (43.6%), were included. Patients were referred a mean of 31.5 (SD 18.82) days before admission for transplant. Dental assessment occurred, on average, 7.88 days (SD 6.78) following referral. Eighty-eight (93.6%) patients were dentate, while six (6.3%) were edentulous. Eighty-eight (93.6%) patients presented with oral disease; 89 (94.7%) patients received dental care. Issues impacting on care were medical ($n = 88$, 93.6%), time constraints ($n = 73$, 77.7%), no GDP ($n = 25$, 26.7%), dental complexity ($n = 5$, 5.3%) and anxiety management ($n = 1$, 1.1%). **Conclusion** The majority of patients required dental care, most of which, for healthy adults, would normally be completed within a primary care setting. However, the issues surrounding the care of patients destined for HSCT indicate that there is a place for a dedicated dental service as part of the multidisciplinary team.

INTRODUCTION

Haematopoietic stem cell transplants (HSCTs) have become a common treatment for a number of haematological conditions, most commonly malignancies such as lymphoma, myeloma and leukaemia. Transplantation involves replacing defective bone marrow cells previously destroyed by high doses of chemotherapy or radiation with new healthy cells. Donor cells may be harvested from bone marrow or from peripheral blood. The transplant may be autologous, using an individual's own haematopoietic stem cells harvested and stored before myeloablative treatment, or allogenic,

involving a donor and recipient who are not immunologically identical.

Cytotoxic treatment performed prior to transplantation results in transient neutropenia and thrombocytopenia. As such, in the period before engraftment (establishment of the HSCT graft), the patient is extremely susceptible to complications such as haemorrhage and infection,¹ which may have life-threatening consequences. The mouth has been described as a source of sepsis in immunosuppressed patients^{2–5} and cytotoxic drugs or the transplant procedure itself may have a direct effect on the oral environment.⁶ Provision of dental treatment without appropriate cover during this time may also produce haemostatic and infective complications.⁷

To minimise these risks, guidelines produced by the Royal College of Surgeons of England (RCS) identify the need for dental pre-treatment assessment, monitoring and the implementation of a preventative care regime for oncology patients.⁸ Clear pathways of care are recommended to reduce the risk

of complications: referral of patients to a designated permanent member of the dental team is the responsibility of a permanent member of the oncology team. The importance of such a framework has been illustrated by the finding that, even if patients are screened and are aware that dentistry is required, they are unlikely to actively seek treatment.⁹

Previous studies have identified a need for dental treatment within populations of oncology patients.^{9,10} Yamagata *et al.*¹¹ recently reported that 92.7% of 41 patients due to receive stem cell transplants presented with one or more dental diseases. Dental assessment prior to HSCT should aim to identify and treat current and potential sources of infection and trauma that may affect the patient in the immediate term. It is hoped that within six months of transplant, the haematopoietic function of the bone marrow will have returned to normal, therefore assessment has a relatively short-term focus. Early dental intervention may also reduce the frequency of oral problems,

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such as mucositis, directly associated with myelosuppressive regimes.¹

However, authors agree to varying extents regarding the criteria for dental intervention prior to chemotherapy and HSCT. Melkos *et al.*¹² reported no significant association between dental foci and infection or survival rate post-transplant and therefore did not recommend radical intervention. Tolanjic *et al.*² investigated the need for treatment in patients with chronic dental pathologies and concluded that intervention in cases of mild or moderate chronic pathology was unnecessary. They reported that if acute events occur, they could be managed without compromising oncologic care. In contrast, Rosenberg³ found that 32% of patients presenting with abscessed teeth during chemotherapy could not be treated, as they were too ill to tolerate treatment.

The duration of time between referral for assessment and transplant is disputed and may differ between centres^{13,14} and according to the type of transplant. As guidelines suggest that the oral environment is stabilised and extractions be carried out a minimum of ten days before chemotherapy begins,⁸ the length of this interval is key to determining management.^{13,14} Extensive treatment need may necessitate either compromise within the dental treatment plan or the delay of HSCT. To optimise outcome and to select the most appropriate environment for treatment, the patient's medical management, the complexity of dental treatment and the accessibility and flexibility of the dental service in question should be considered.¹⁴

This paper is the result of an audit involving the patients referred to the Salaried Primary Care Dental Service (SPCDS) for assessment prior to receiving HSCTs for various haematological conditions at the Western General Hospital, Edinburgh. The aims of this study were to establish treatment needs of patients referred for pre-HSCT dental assessment and to identify the aspects of patient management impacting on their care.

SUBJECTS AND MATERIALS

The original audit was conducted as a retrospective analysis of patients referred to the Dental Department (part of the Lothian Salaried Primary Care Dental

Table 1 Factors impacting on patient management

Category	Explanation
Medical complexity	Pre-examination medical investigations required Medical interventions* co-ordinated with dental treatment
No GDP	Not registered with a general dental practitioner
Time constraints	Referral less than six weeks before transplant**
Dental complexity	Need for surgical treatment which may not be available in general practice
Anxiety	Need for sedation

*Platelet counts below 50×10^9 per litre required platelet infusions as per local haematology department guidelines. Extractions and scaling delayed in patients with neutrophil counts below 1.5×10^9 per litre as per RCS guidelines. Antibiotic prophylaxis may be required in patients whose neutrophil counts are borderline; the decision is made on an individual patient basis.

**The time interval of six weeks was determined on the basis that patients were seen on average eight days after initial referral and ideally surgical treatment should be completed ten days before transplant, leaving less than four weeks for the completion of dental treatment.

Table 2 Average age, oncologic diagnosis and average number of appointments for patients referred to the dental unit for pre-HSCT assessment

Diagnosis	No. of patients	Mean age years (SD)	Number of appointments (SD)
Non-Hodgkin's lymphoma	32	54.1 (6.8)	1.9 (1.2)
Myeloma	26	53.65 (10.1)	1.7 (1)
Acute myeloid leukaemia	13	45.4 (12.5)	1.7 (0.9)
Hodgkin's lymphoma	9	39.3 (11.1)	2 (0.7)
Acute lymphoblastic leukaemia	8	28.8 (10.7)	3.1 (2.5)
Chronic lymphoblastic leukaemia	1	59	2
Chronic myeloid leukaemia	1	47	2
Myelodysplastic syndrome	3	52 (5)	2 (1)
Myelofibrosis	1	56	1

Service Special Care, Hospitals and Older People team) at the Western General Hospital, Edinburgh for dental assessment prior to undergoing HSCT between April 2004 and July 2007. Both autogenous and allogenic transplants were included. The aim of the audit was to establish the treatment needs of the study population and define the role of the department in treating these patients.

Original patient assessment was carried out according to the RCS guidelines⁸ and was performed by one of two community dentists. Treatment plans were based on the findings of clinical and radiographic exams, using the protocol as a guide. Each case was assessed on an individual basis and decisions were at the ultimate discretion of the lead dentist in the unit.

The charts of 116 patients were reviewed, and 94 of these patients were included in the study. Patients with incomplete dental charts and those who

were referred but then sent to other centres for dental assessment for geographical reasons were excluded. As the Western General Hospital (WGH) is the regional centre for HSCTs, serving areas from Fife to the Borders, patients may be referred to the dental department initially but their care is transferred to primary care dental services closer to the patient's home.

A form was developed following a pilot stage to facilitate the collection of information from the patients' records regarding demographics, presenting conditions and treatment received. Issues complicating the management of patients' care were taken from the notes and categorised as in Table 1. The data was then analysed with the use of a spreadsheet (Microsoft Excel 1997, Microsoft Corporation, USA) and statistical analysis was performed using Instat Graphpad™ Intuitive Software for Science, San Diego, USA.

Table 3 Presenting conditions reported in dentate patients

Pathology	Number of patients (% of dentate)
Gingivitis	45 (51.1)
Calculus	54 (61.4)
Alveolar bone loss	38 (43.2)
Caries	46 (52.3)
Failing restorations	14 (15.9)
PA pathology	18 (20.5)

RESULTS

Fifty-two men (55.3%) and 42 women (43.6%) were included in the study. Ages ranged from 18 years to 67 years; the mean age was 49 years. The number of patients and type of malignancy is shown in Table 2.

Patients were referred on average 31.5 days (SD 18.82) before the scheduled transplant date, and were seen for dental assessment within eight days of referral (mean 7.88 days, SD 6.78). Seventy-three patients (77.7%) were referred within six weeks of transplant date; of these patients, 67% (49 patients) had less than four weeks between initial referral and transplant.

The average number of appointments was two (SD 1.2). Forty-four (46.8%) patients only required one appointment; the maximum number of appointments was seven. Sixty-one percent of patients reported a history of regular dental attendance, 19% reported occasional attendance and 20% reported attendance only with trouble.

In order to complete a thorough clinical exam and treatment, pre-treatment precautions were required in dentate patients. All 88 dentate patients had haematological investigation to determine specifically their platelet and neutrophil counts. Following this, nineteen patients required antibiotic cover to reduce the risk of post-operative neutropenic sepsis. Eleven patients required platelet transfusions to prevent post-operative haemorrhage.

Presenting oral conditions

Eighty-eight (93.6%) of the patients were dentate and six (6.3%) were edentulous. Six patients of 94 (6.4%) had no reported signs of oral disease.

Table 4 Dental treatment completed

Treatment	Number of patients (% of dentate)
Oral hygiene instruction	63 (71.6)
Scaling/polish/fluoride application	39 (44.3)
Restorations	19 (21.6)
Root canal treatment	1 (1.1)
Extractions	36 (40.9)
Surgical extractions	5 (5.7)
Immediate partial dentures	6 (6.8)

Fig. 1 Number of patients, of total population $n = 94$, affected by each identified management issue

The number of dentate patients presenting with each common dental condition, diagnosed by clinical and radiographic exam, is stated in Table 3. Seventy patients (79.5%) presented with signs of periodontal disease. In 18 cases the clinician recorded that they were unable to perform a basic periodontal exam (BPE) due to insufficient information about the patient's haematological status.

Of the edentate patients, four had good oral hygiene and two had fair oral hygiene with denture stomatitis.

Treatment received

Eighty-nine (94.7%) patients received dental care including oral hygiene instruction. Seventy patients (74.5%) received interventional treatment; 19

patients (20.2%) required nothing but oral hygiene instruction.

Treatment completed for dentate patients is summarised in Table 4. Not all patients received treatment for all their dental problems. Treatment was prioritised, taking into account the risk of sepsis post-transplant and the time available.

Oral hygiene instruction was given to two edentate patients and one complete denture was adjusted and relined.

Significantly fewer (29.8%) patients who reported regular attendance required extractions as part of the management process compared with those who reported occasional attendance and attendance only in pain (54.8%) ($p < 0.05$, Kruskal Wallis test 95% confidence intervals).

The SPCDS carried out treatment in all but one case, where it was shared with the GDP. The numbers of patients affected by each management issue are shown in Figure 1.

Only one patient did not complete the advised treatment plan, failing to return for oral hygiene instruction. The agreed treatment was completed before the date initially scheduled for transplant in all but two cases, where transplant was delayed after discussion with the oncology team.

DISCUSSION

The results of this project indicate that there is a substantial need for dental care within this study population. 93.6% of patients had signs of mucosal or dental disease at initial consultation; this included candidal infection, periodontal disease, caries and periapical pathology. The overall incidence of dental disease was similar to those described by Yamagata *et al.*,¹¹ who examined a similar study population. The overall incidence of periodontal diseases (79.5%), ranging from gingivitis to periodontal pockets greater than 6 mm, was also similar. Recorded levels of gingivitis appear low (51%); this may be because BPE could not be performed if haematological status was unfavourable. This situation arose in 18 cases, illustrating the difficulty of co-ordinating the availability of test results and appointments. Levels of caries and periapical pathology were lower than those described by other authors investigating populations of stem cell transplant recipients.^{11,12}

Reported dental attendance compares favourably with the figures quoted in the Adult Dental Health Survey (ADHS) 1998, with two-thirds of patients reporting regular attendance.¹⁵ In the current study population, as in the 1998 ADHS, patients attending the dentist only with trouble had significantly higher odds of having decayed or unrestorable teeth,¹⁶ which would then be judged in this study to require extraction.

There are limitations in comparing studies involving different groups of oncology patients, as it is accepted that disease levels differ according to the type of malignant disease.^{9,10} Even when similar populations are involved, direct

comparisons are difficult, as indices used for assessment of disease vary between authors and are often subjective. As there is no universally accepted protocol for treatment planning and the use of guidelines inherently introduces an element of flexibility, outcomes may also differ. Retrospective analysis, as used in our study, has limitations as it prevents the official standardisation of examiners prior to data collection. However, within our study a single standard protocol was used and all treatment plans were finalised by the lead clinician, thus reducing variation.

The number of HSCT patients referred from the oncologists per year has been around 40 (41 in 2005, 37 in 2006) and this figure may increase due to the widening application of HSCTs as a treatment modality. The WGH dental department currently runs four dentist sessions per week, treating just over 100 medically compromised patients per month. This service is supported by one hygienist session per week. As the most common reported conditions in this study population were periodontal, recommendations for the future could include increasing the role of hygienists in treating these patients. Other recommendations include the distribution of further written guidelines for colleagues at distant regional SPCDS clinics to whom the responsibility of pre-transplant dental assessment and care is passed. These would build upon the existing broad RCS guidelines, reflecting more recent experiences and being specific to HSCT patients.

These guidelines should stress the importance of reviewing the results of assessment in the context of the individual patient when treatment planning.¹⁷ As well as including active treatment, plans should include a preventative approach and arrangements for follow-up care. Factors that require consideration are the patient's dental motivation, nature of the dental disease, the patient's medical health and the time available for treatment. Barriers to seeking dental care may be logistical or financial and, at a time of great anxiety for patients, facilitating access to care should be a priority.

Time available for dental treatment before transplant is limited and appointments should, whenever possible, be

scheduled alongside other medical appointments. The second most common management issue in this study was the limited time available for treatment. The majority of patients required more than one appointment and the average time between referral and admission for initiation of myelosuppressive treatment was a month. Taking this and the guidance that extractions should ideally be completed at least ten days before the induction therapy into account, the time available for dental treatment may be reduced to two weeks.¹⁵

Access to the general dental service in Lothian and across the UK is extremely variable. Forty percent of our patients reported seeking dental care occasionally or only when in pain, suggesting irregular attendance and the possibility of lapsed registration. It is unlikely that a course of treatment, especially for unregistered patients, would be completed within two weeks. Patients who are regular attenders may feel more comfortable attending the dentist with whom they are familiar¹³ but this simply may not be practical.¹⁴ Referral to a dental clinic within the hospital is convenient for the patient and reduces administrative delays; appointments can be arranged to coincide with visits to the oncology unit and in co-ordination with blood tests and transfusion of blood products.

Treatment provided by the SPCDS during this study was free of charge, as it was part of the patient's overall hospital care. If the general dental service (GDS) had provided it, NHS or private fees would have applied. This and the system of direct referral are likely to have improved compliance within our study population. The prescribed dental interventions are deemed necessary to allow the initiation of oncologic therapy and prevent post-operative infection and its associated cost implications. With the planned merger of the GDS and SPCDS, financial arrangements for these patients may have to change and it could be argued that exemption from charges for immediate treatment needs may be appropriate.

Our results suggest that the management of all dentate patients within the study population could be considered

medically complex: haematological investigations were carried out prior to dental treatment and subsequent medical intervention was often required for treatment to proceed. Direct liaison with treating physicians, the receipt of test results and the administration of blood products is more difficult within a general practice setting. General dental practitioners (GDPs) may not feel able to manage such patients, preferring to refer them to a secondary care facility.^{18–20} Other reasons commonly cited for referral to a secondary care or a specialist setting include the need for surgical extractions and sedation.¹⁹ A minority of patients in this study required this treatment: five required surgical extractions and one required nitrous oxide inhalation sedation, the least commonly available method of sedation in general practice.²¹ Assessment within a specialised dental service which forms part of the multidisciplinary team has the advantage of providing direct access to practitioners with the required level of experience and sedation facilities, who can liaise easily with the rest of the team.

There is no universally agreed protocol for pre-transplant dental treatment. More recent work has suggested that patients with chronic pathologies may warrant a conservative approach when treatment planning.^{2,22,23} Peters *et al.*²² found that the treatment of post-endodontic asymptomatic periapical radiolucencies was unnecessary and Akintoye *et al.*²³ found no relationship between periodontal condition and sepsis or mortality post-transplant. Toljanic *et al.*² concluded that the conversion of severe chronic conditions to acute events was low (10%), and that such incidents could be managed without interruption to oncologic care. However, the significance of leaving potential sources of infection untreated should not be underestimated: infections during immunosuppression^{2–5} may be life-threatening and

affect the outcome of cancer therapy.²⁴

With the restricted evidence and seemingly contradictory findings, the clinician's experience and the patient's wishes may play an important role in determining the course of dental treatment. If there are doubts, risks and benefits of treatment should be discussed with the oncologist. This communication is important for both the oncologist and the dentist to aid the provision of care and to reassure the patient during a difficult time that a knowledgeable multidisciplinary team is behind their care. A dedicated dental service within the hospital appears to be an effective way of facilitating this.

CONCLUSION

The majority of patients required dental care, most of which, for healthy adults, would normally be completed within a primary care setting. However, the issues surrounding the care of patients destined for HSCT indicate that there is a place for a dedicated dental service as part of the multidisciplinary team. The role of this service should be to provide a seamless interface between the medical and dental interventions necessary to establish optimal oral health prior to profound myelosuppression.

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