The use of PROMOGRAN™ to manage a patient suffering radiation damage after a laryngectomy

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This case report focuses on the management of a 42-year-old woman who was diagnosed with a laryngeal tumour in 2002 and it illustrates some of the problems associated with wound management in a patient with radiation damage and a compromised ability to heal.

Laryngeal cancer

Epidemiology

Laryngeal cancer is the most common type of cancer of the upper respiratory tract. There are about 23,000 cases in the UK, accounting for 1% of all cancers (Cancer Research UK, 2005). Cancers of the head and neck account for about 5% of all cancers worldwide (Buglass, 1995; Whale, 1998).

Aetiology

Major risk factors for laryngeal cancer include the use of tobacco products and/or excessive alcohol consumption (especially spirits), (Vokes et al, 1993; Buglass, 1995; Mood, 1997). The disease most often afflicts men in their 50s and 60s, but there has been a steady increase in the number of women which may coincide with the increased incidence of smoking and heavy drinking among women (Haynes, 1996). Other risk factors are occupational exposure to dust, fumes, gases and cleaners, and environmental carcinogens (Reese, 1996; Shah et al, 1997).

Despite advances in treatment, the five-year mortality rate for head and neck cancers has not altered significantly over the past 40 years (Semple, 2001). Early detection of laryngeal cancer has been associated with excellent chances of long-term survival with minimal dysfunction (McEleney, 1996; Mood, 1997). Most head and neck cancers are detected only after patients have developed very obvious symptoms and unfortunately there is a clear association between advanced disease and decreased survival.

Tumour location and prognosis

The prognosis and treatment of laryngeal cancer depends on the stage and location of the tumour within the larynx. For diagnostic purposes, the larynx is divided into the supraglottic, glottic and subglottic regions (*Figure 1*).

Glottic tumours

More than 50% of tumours are located in the glottic region which houses the vocal cords that allow phonation and protect the airway during swallowing. The vocal cords also facilitate coughing which is important for cleansing the airway. When the glottis is the site of origin of the tumour, intermittent hoarseness can appear early in the disease, followed by voice changes, sore throat, dysphagia, referred ear pain (otalgia) and shortness of breath if the tumour is not caught early. Radiotherapy is the primary treatment modality for Stage 1 glottic tumours with a success rate as high as 96% if treated early (Dhillon and East, 1994); as lymphatic drainage in this area is sparse and therefore spread of disease usually occurs late. The other treatment option is transoral laser surgery for the management of both Stage 1 and Stage 2 tumours.

Supraglottic tumours

The supraglottic region serves as a passageway for air and protects the airway. Tumours tend to present at a more advanced stage with symptoms related to swallowing such as dysphagia and aspiration. There is often spread to the nodes with patients having a 25% worse prognosis than those with comparable glottic lesions.

Subglottic tumours

Primary tumours are rare, with most tumours in this region being an extension of tumours in other areas of the larynx. There tends to be significant airway obstruction such as dyspnoea and stridor. Because of the lymphatic drainage from this area paratracheal and superior mediastinal nodes are a usual complication which makes surgery difficult and prognosis poor.

Classification of laryngeal cancer

Laryngeal cancer is staged by TNM (tumour, node, metastasis) classification system. The 'T' classifies the tumour according to several factors, such as its size and spread into adjacent anatomical structures.

Staging

- Tumour in situ (TIS): sometimes referred to as precancerous changes. The cancer cells are completely contained on the inner surface of the larynx. They have not started to spread into the deeper layers of the larynx.
- Stage 1 tumours: these are small (<2cm) and limited to one area of the larynx. They

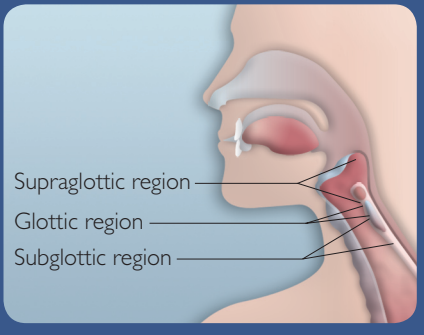

Figure 1. Regions of the larynx.

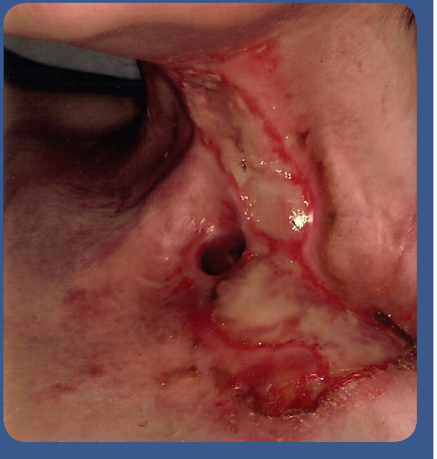

Figure 2. Skin reaction to radiation treatment.

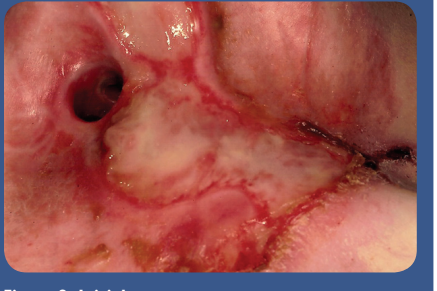

Figure 3. Initial assessment.

may appear as a lump or just a small area of abnormal cells.
- Stage 2 tumours: these are larger (>2cm, but <4cm), and affect more of the larynx
- Stage 3 tumours: these have spread into the lymph nodes within the neck or have stopped the vocal cords working completely and are >4cm.
- Stage 4 tumours will have spread beyond the larynx into surrounding areas of the neck, such as the oesophagus, trachea or thyroid gland, or to other parts of the body (secondary cancer).

The 'N' classification shows nodal spread and the 'M' shows metastatic spread to other organs in the body. The lungs are the most common site for metastases, but laryngeal cancer can also spread to the bone, liver and brain.

Assessment and diagnosis

When taking the patient's medical history patients are asked about the onset and duration of symptoms which can include:
- Hoarse voice
- Lump in the throat or neck
- Breathlessness
- Discomfort or pain when swallowing
- Continuing earache.

The location and extent of the tumour are evaluated clinically by laryngoscopy, palpation and various radiological studies including chest X-ray, barium swallow, computed axial tomography (CAT) scan and biopsy.

Treatment options

Radiotherapy, surgery or chemotherapy may be used alone or in combination to treat cancer of the larynx:
- Radiotherapy will cure most people with small tumours of the larynx
- Laryngectomy (surgical removal or partial removal of the larynx) may be necessary for larger tumours
- Chemotherapy may be used before or during radiotherapy to try to shrink the tumour and make the radiotherapy more likely to cure the cancer. This treatment aims to avoid having to remove the larynx to allow the patient to keep their voice. Chemotherapy may also be used if the cancer has spread beyond the larynx (CancerBACUP, 2004).

Laryngectomy stoma

A laryngectomy stoma is a permanent stoma required following the removal of the larynx when there is no longer any connection between the nose and mouth to the lungs. The laryngectomy stoma becomes the patient's only airway. Most laryngectomy stomas remain open without the use of tubes, however, some stomas do shrink requiring the use of tubes, stoma vents or stoma buttons. Patients are provided with support and advice from both nursing and speech and language therapy staff on laryngectomy care and hygiene (Feber, 2000).

Patient history

The patient was a 42-year-old woman who lived with her partner (who was alcohol-dependent) in a deprived inner-city area. She had a son and daughter from a previous relationship who were in their 20s and no longer lived with her but whom she saw on a regular basis. She was very close to her mother and three sisters who had been very supportive to her throughout many years of anxiety attacks coupled with depression linked to her own alcohol dependency. She was also a heavy smoker.

In April 2002 the patient sought medical advice after a year of throat pain, otalgia and more recent problems with swallowing. She was diagnosed with a malignant T4 laryngeal tumour for which she had a total laryngectomy with left neck dissection in May 2002 when a laryngeal stoma was fashioned to provide an airway. This was followed by postoperative radiotherapy when she experienced some problems with moist desquamation which led to erythema and skin breakdown, and some stoma shrinkage.

She was readmitted three months post-surgery complaining of stoma shrinkage and a reaction to radiotherapy treatment.

Management

On admission the patient was seen by a wound research nurse and commenced on a combination of hydrogel and foam in an attempt to soothe the skin's reaction to the radiation as it had become infected (*Figure 2*).

On October 23rd 2002, the research nurse left and the patient was referred to the tissue viability nurse when a full assessment of the patient and the wound was undertaken. The wound measured 11cm by 5cm, was covered in 100% slough with the surrounding skin appearing inflamed and erythematous, causing the patient to complain of constant discomfort from the wound site (*Figure 3*) which was exacerbating her depression. Her alcohol and tobacco dependencies, together with her systemic problems, were severely comprising wound healing (Moore, 2003).

The aim of wound management is to create the optimal wound healing environment and it was felt appropriate to initiate treatment with a protease-modulating matrix combining oxidised regenerated cellulose (ORC) and collagen (PROMOGRAN™, [Johnson & Johnson Wound Management, Ascot]). The matrix dressing was used in combination with a prophylactic iodine-impregnated gauze (Inadine™ [Johnson & Johnson Wound Management, Ascot]) as the patient was at risk of further infections, and a hydropolymer dressing (Allevyn™ Smith & Nephew, Hull). The secondary dressings were changed every two days due to the exudate level. At this stage the patient was also suffering psychologically, struggling to come to terms with not only her altered body image but also with the fact that the prognosis was grim and there were no other treatment options. This psychological trauma manifested itself in anger towards family, friends, nurses and herself.

On November 8th the rate of exudate started to decrease thereby improving the condition of the surrounding skin (*Figure 4*), and the patient was pleased that her neck felt more comfortable with the new dressing regimen.

Two weeks later the wound continued to improve with signs of healthy granulation tissue and some epithelialisation evident (*Figure 5*). It had also decreased in size to 8cm by 3cm.

On December 6th 2002 the secondary dressing was changed to Tielle Lite™ (Johnson & Johnson Wound Management, Ascot) (also a hydropolymer), due to decreased exudate levels and the dressing was changed every 3–4 days (*Figure 6*).

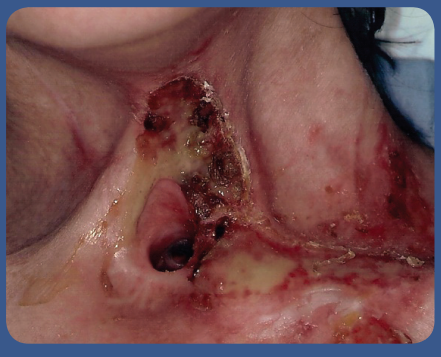

Figure 4. Exudate decreasing.

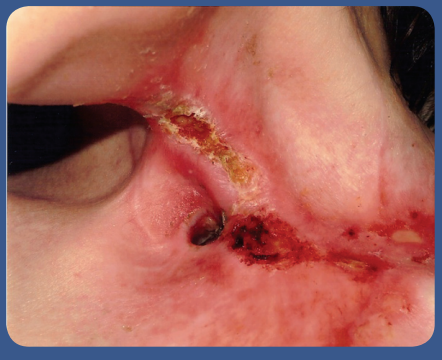

Figure 5. Signs of granulation.

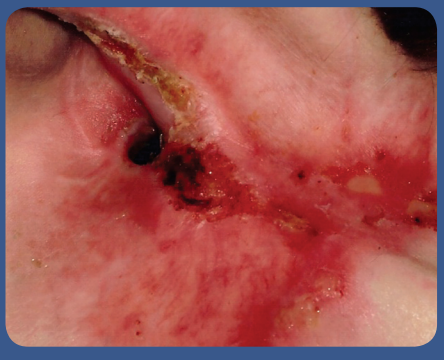

Figure 6. Decreased exudate.

PROMOGRAN™ is a protease-modulating matrix combining oxidised regenerated cellulose (ORC) and bovine collagen (Cullen et al, 2002; Hart et al, 2002). It helps promote healing by creating an environment that supports endogenous growth factors, and simultaneously deactivates the enzymes responsible for degrading and prolonging wounds (Cullen et al, 2002). It also prevents the destruction of extracellular matrix (ECM) by uncontrolled proteases (whose activity increases in compromised wounds) resulting in degradation of growth factors important in healing, such as platelet-derived growth factor (PDGF), (Chen et al, 1997). This degradation is a major factor in preventing healing.

PROMOGRAN™ modulates and rebalances the chronic wound environment by binding and inactivating the proteases, which have been shown to be in excess in chronic wounds, and by binding and protecting naturally occurring growth factors, such as PDGF, against degradation by these enzymes.

Although PROMOGRAN™ closely resembles a dressing, it acts as a treatment to rebalance the wound environment. It is bio-absorbable, and is therefore absorbed directly into the wound bed thus avoiding traumatic dressing changes or removal of residual tissue remains. It can be applied to surface or cavity wounds, wet or dry, depending on exudate levels. If a wound produces small amounts of exudate PROMOGRAN™ can be moistened with normal saline to turn it into a gel. It is designed for use in all types of open wounds that are free from necrotic tissue and visible signs of infection.

In vitro evaluations and pre-clinical in vivo studies have shown that, compared with non-adherent dressings, PROMOGRAN™ accelerated the rate of wound closure (Cullen et al, 2002; Cullen et al, 2002; Hart et al, 2002). Additional analyses suggest it may also be a cost-effective agent in the treatment of chronic wounds (Ghatnekar et al, 2002). The PROMOGRAN™ matrix should be covered with a hydropolymer dressing to maintain a moist wound environment and re-applied every three days.

Conclusion

Unfortunately by February 2003 the patient's general condition rapidly deteriorated, both physically and psychologically. She found it difficult to keep her nasogastric tube in place, pulling it out on numerous occasions and she also found it difficult to tolerate any dressings on her neck and removed them most days. It was thus felt appropriate to discontinue treatment with PROMOGRAN™. A couple of weeks later the patient was transferred to a hospice where she died peacefully in March 2003. While healing was not an expected outcome for this patient the use of PROMOGRAN™ nonetheless improved her health-related quality of life, albeit only for a few months. WUK

This case study reflects the wound dressings that were readily available at the time this patient presented.

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