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Application of negative pressure wound therapy after skin grafting in the treatment of skin cancer: A case report

Gao-Shi Huang, Ke-Chen Xu

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Abstract

BACKGROUND

Skin cancer is a common malignant tumor in dermatology. A large area must be excised to ensure a negative incisional margin on huge frontotemporal skin cancer, and it is difficult to treat the wound. In the past, treatment with skin grafting and pressure dressing was easy to cause complications such as wound infections, subcutaneous effusion, skin necrosis, and contracture. Negative pressure wound therapy (NPWT) has been applied to treat huge frontotemporal skin cancer.

CASE SUMMARY

Herein, we report the case of a 92-year-old woman with huge frontotemporal skin cancer. The patient presented to the surgery department complaining of ruptured bleeding and pain in a right frontal mass. The tumor was pathologically diagnosed as highly differentiated squamous cell carcinoma. The patient underwent skin cancer surgery and skin grafting, after which NPWT was used. She did not experience a relapse during the three-year follow-up period.

CONCLUSION

NPWT is of great clinical value in the postoperative treatment of skin cancer. It is not only inexpensive but also can effectively reduce the risk of surgical effusion, infection, and flap necrosis.

Key Words: Skin cancer; Negative pressure wound therapy; Skin grafting; Case report

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Core Tip: The most common types of skin cancer include cutaneous squamous cell carcinoma (SCC), cutaneous basal cell carcinoma, and cutaneous malignant melanoma. The main treatment options are surgery and radiotherapy. We report a 92-year-old woman with skin cancer who had a 4 cm × 5 cm mass on the right forehead. A pathological examination of the right frontal mass confirmed the diagnosis of highly differentiated SCC. After surgical treatment, Negative pressure wound therapy was adjunct. We found that this technology helps to reduce the risk of surgical effusion, infection, and flap necrosis. No recurrence was observed during the three-year follow-up. The patient is still alive.

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INTRODUCTION

Skin cancer is a prevalent malignant condition worldwide. Fair skin and long-term exposure to ultraviolet B rays are the most important risk factors[1]. Therefore, early preventative measures mainly involve avoiding sun exposure and tanning beds[1]. Reducing the recurrence rate and improving skin-graft survival in the treatment of skin cancer are challenging [1]. The current treatments for skin cancer include surgery, radiation, cryotherapy, Mohs chemotherapy, electrotherapy, and some topical ointments and dressings as additional options[2]. Although surgical modalities remain the mainstay treatment, new research and fresh innovation are still needed to reduce morbidity and mortality[3].

Negative pressure wound therapy (NPWT) has been widely utilized in skin grafting and surgical wound healing[4]. However, reports on its clinical application following skin cancer surgery are limited. In contrast to previous reports on the cost-utility value[5] and the effect of NPWT in reducing lymphatic leakage[6] in skin cancer, we found that this technology helps to reduce the risk of surgical effusion, infection, and flap necrosis.

CASE PRESENTATION

Chief complaints

A 92-year-old woman presented to the surgery department complaining of ruptured bleeding and pain in a right frontal mass for two weeks.

History of present illness

Symptoms started two weeks before presentation with ruptured bleeding and pain in a right frontal mass.

History of past illness

The patient had hypertension for more than seven years and had taken amlodipine besylate tablets for a long time. The patient's self-reported blood pressure control was satisfactory. The patient had a right frontal mass one year ago, which was about the size of a grain of rice, with no obvious cause. Because it did not adversely affect her, she did not pay attention to it, and the lump gradually increased in size. The tumor increased significantly in the recent five months to about 4 cm × 5 cm in size.

Personal and family history

The patient denied any family history of skin cancer.

Physical examination

On physical examination, the vital signs were as follows: Body temperature, 37.1°C; blood pressure, 148/54 mmHg; heart rate, 63 beats per min; and respiratory rate, 20 breaths per min. A ruptured mass, with a diameter of 4 cm, was found on the right forehead. There was no discharge of pus or significant bleeding.

Laboratory examinations

Routine blood levels were normal (red blood cell count, 3.49×10^{12} PCS/L; hemoglobin, 106 g/L; mean platelet volume, 10.7 fL; and platelet volume distribution width, 12.1%). Serum hormone levels were also normal (total triiodothyronine, 0.76 ng/mL; thyrotropin, 7.35 μ IU/L). Urinalysis findings were normal (hematuria, +; leukocyte esterase, ++; white blood cell count, +).

Imaging examinations

Computed tomography examination of the lungs revealed calcified nodules in the lower lobe of the left lung and a calcified aortic wall. B-ultrasound examination revealed multiple calcifications of the liver, gallstones, and cysts in both

kidneys.

FURTHER DIAGNOSTIC WORKUP

The mass appeared to be deep and subcutaneous fat layer. During surgery, the base of the mass and the surrounding skin were completely excised along a circumference of 2 cm. A pathological examination of the right frontal mass confirmed the diagnosis of highly differentiated squamous cell carcinoma (SCC). Rapid pathologic examination showed that the operative margin was negative.

FINAL DIAGNOSIS

Combined with the patient's medical history and pathological examination, the final diagnosis was skin cancer.

TREATMENT

We successfully implemented NPWT following skin grafting to treat a 92-year-old woman with skin cancer. The patient presented with a cauliflower-shaped mass measuring 4.0 cm × 5.0 cm on the right frontotemporal region. The mass had been present for two years and ulcerated for one month (Figure 1A). The biopsy results showed squamous cell carcinoma (SCC, Figure 2). The patient had a seven-year history of hypertension and was being treated with Captopril. After completing the relevant examinations, the patient underwent radical skin cancer surgery with skin grafting under local anesthesia, followed by NPWT.

The treatment process steps were as follows (Figure 1): (1) The tumor size and the longest and shortest meridians were measured (Figures 1A and B); (2) The donor region for a skin graft of the same size was identified in the relaxed skin area of the abdomen; (3) The tumor was completely excised with a 2 cm margin from the cut edge. The use of an electric knife was avoided to prevent thermal damage to the incisional margin. This approach was employed to reduce the risk of graft necrosis and scar formation; (4) Intraoperative pathology was quickly performed to assess the incisional margins. Meanwhile, the skin graft was excised from the donor site. The subcutaneous fat of the graft was removed into physiological saline, and multiple small holes were made on the graft using a sharp knife. This technique allowed for beneficial negative pressure suction, thereby preventing subcutaneous fluid accumulation and ensuring tight adherence of the skin graft to the wound surface, promoting graft survival (Figure 1C). (5) The graft was sutured intermittently onto the wound (Figure 1C); and (6) External sealed negative pressure was applied at 15 KPa. Negative pressure was discontinued after seven days, and a regular bandage was applied (Figure 1D). The postoperative pathological report of the mass showed highly differentiated SCC with a negative margin. No recurrence was observed during the three-year follow-up (Figure 1E).

OUTCOME AND FOLLOW-UP

The patient was free of recurrence and still alive three years after surgery.

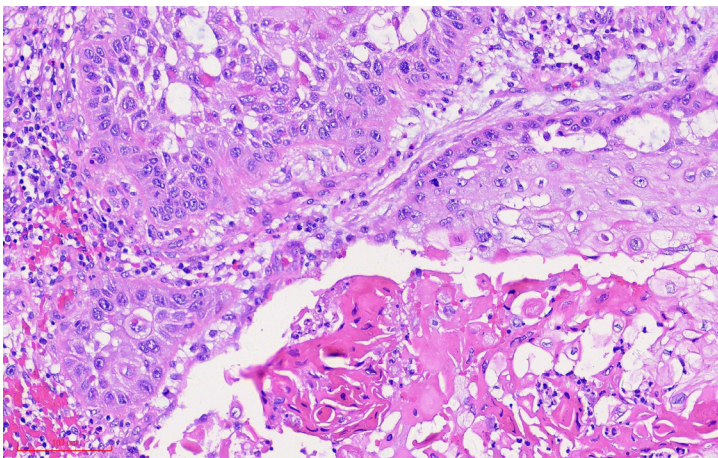
DISCUSSION

Skin cancer includes basal cell carcinoma and SCC[1]. SCC comprises approximately 16% of skin cancer cases. It predominantly manifests near the ears, on the vermillion border of the lips, and in scars. SCC is prone to metastasizing and may require extensive surgical intervention[7]. Treatment of large SCC tumors with infiltrative growth is challenging. Due to the large size of the tumor and the limited laxity of the forehead and facial skin, adherence to surgical standards necessitates the removal of a 2 cm margin around the tumor. Consequently, a notable amount of skin is lost in the surgical area, necessitating skin grafting from the abdomen. Graft survival after transplantation is a primary concern for doctors. NPWT is an efficient drainage technique that has emerged in recent years to fully drain and promote wound healing[8]. It can reduce the risk of infection, improve local microcirculation, increase the oxygen content of the wound tissue, promote the growth of granulation tissue, and significantly expedite healing[9,10]. Negative pressure drainage facilitates the timely removal of exudate and necrotic tissue from the drainage area, thereby suppressing aggregation and any infection in the wound, stimulating the rapid and optimal growth of granulation tissue, and accelerating wound healing. This technique also facilitates blood transport to the wound, exerting pressure to create a close fit between the graft and the wound without any gap, thereby ensuring a normal blood supply. Continuous negative pressure suction facilitates the continuous transfer of bodily fluids from the wound to the drainage tube, thereby providing effective and continuous auxiliary power for the wound surface. Additionally, it effectively prevents the formation of dead spaces.



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Figure 1 Treatment process of skin cancer. A: Skin mass before surgery; B: The skin mass was 4 cm in diameter; C: Skin flap transplantation after skin cancer surgery; D: Application of negative pressure wound therapy after skin cancer surgery; E: Prognostic effect after treatment.



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Figure 2 Histopathological analysis of the skin mass (hematoxylin-eosin; magnification, 200×).

CONCLUSION

The patient in this case underwent skin grafting with the assurance of a negative surgical margin and benefitted from the above advantages, thereby achieving a favorable outcome. Conventional skin grafting typically involves the use of pressure bandages. However, the pressure provided by these bandages is uneven, and the skin graft cannot fully adhere to the wound tissue. Insufficient pressure on the edges of the graft can result in loose areas between the graft and wound and, in turn, impaired angiogenesis, ischemic necrosis of the graft, subcutaneous fluid accumulation, and wound infection. Considering these issues, it was decided to use NPWT for this patient. She did not experience relapse during the three-year follow-up period, confirming the beneficial effect of NPWT in this case.

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