

Reconstruction of Periarticular Oncological Defects with Keystone Flap

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ABSTRACT

Due to the complex anatomy, mobility requirements and limited tissue availability of joints, periarticular defects resulting from oncological resections pose a significant challenge to reconstruction. The keystone flap is a reliable, versatile and relatively straightforward option for soft tissue reconstruction in these challenging areas. This article presents clinical cases from our Plastic Surgery Department and discusses the advantages and clinical outcomes of using the keystone flap to manage oncological periarticular defects.

Keywords: Keystone flap; Oncological; Periarticular Defects.

ARTICLE INFORMATION

Received: 30 May 2025

Accepted: 10 June 2025

Published: 17 June 2025

Cite this article as:

Sara Silva, Manuel Vieira. Reconstruction of Periarticular Oncological Defects with Keystone Flap. Open Journal of Medical Images and Case Reports. 2025; 2(2): 01-04.

<https://doi.org/10.71123/3067-1078.020201>

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BACKGROUND

Oncological resections near joints often result in significant soft tissue defects, exposing vital structures. Effective reconstruction in these areas requires these structures to be covered while joint function and aesthetic appearance are maintained.

Reconstructive options for periarticular soft tissue defects remain challenging (1). Conventional approaches, including complex pedicled and free flaps, are often associated with prolonged operative times, increased donor site morbidity, and suboptimal aesthetic outcomes. Building on our extensive experience of using keystone flaps for facial and dorsal reconstruction (2, 3), our senior surgeon adapted this technique for use in treating periarticular oncological defects. In this article, we present a series of clinical cases from our Plastic Surgery Department in which

periarticular defects following tumour resection were reconstructed using keystone flaps. This method offers a reliable and versatile solution that utilises local tissue. It has the advantages of technical simplicity, reproducibility and adaptability to varying defect sizes and anatomical locations (4, 5). Furthermore, it is well-suited to a wide variety of clinical settings, including outpatient and ambulatory surgical environments (4, 5).

CASES PRESENTATION

Neck

This case study illustrates the successful use of a keystone flap to cover a free-form defect in the cervical region. Despite the patient having limited skin laxity and a restricted arc of rotation, the flap provided reliable coverage and produced good aesthetic results (Figure 1).

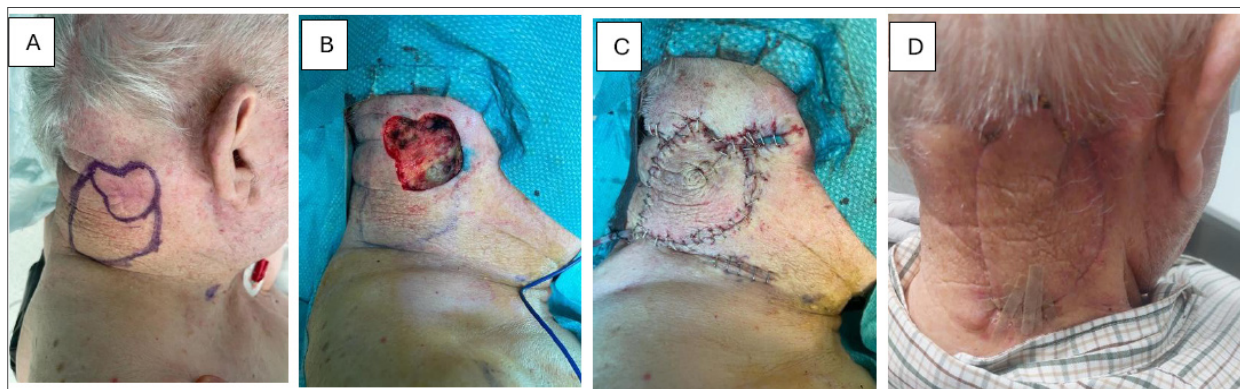


Figure 1. Keystone flap to cover a cervical defect; A – preoperative; B-C – intra operative; D – post operative

Shoulder

Following tumour resection, defects in the deltoid region require stable coverage that accommodates contour and mobility. The keystone flap preserves shoulder function by avoiding tension across the glenohumeral axis (Figure 2).

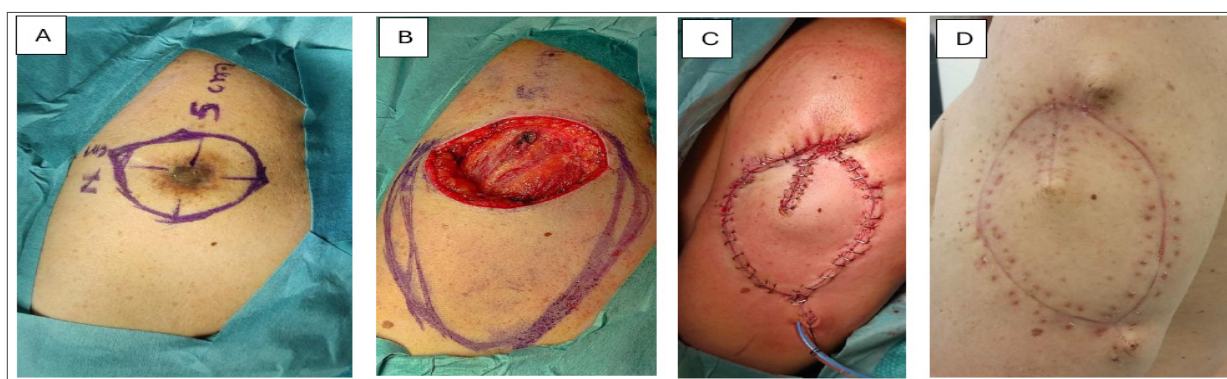


Figure 2. Keystone flap to cover a shoulder defect; A – preoperative; B-C – intra operative; D – post operative

Elbow

In this case, the keystone flap made it possible to perform both functional and cosmetic reconstruction, enabling a full range of joint motion while avoiding vascular compromise and scar contracture. The patient was able to return to work as a personal trainer without any restrictions (Figure 3).



Figure 3. Keystone flap to cover an elbow defect; A – preoperative; B-C – intra operative; D-F – post operative

Knee

A small bilateral keystone flap was used to address a knee defect. The patient experienced minor wound dehiscence due to distal flap necrosis, but this was managed conservatively and healed without any long-term issues (Figure 4).

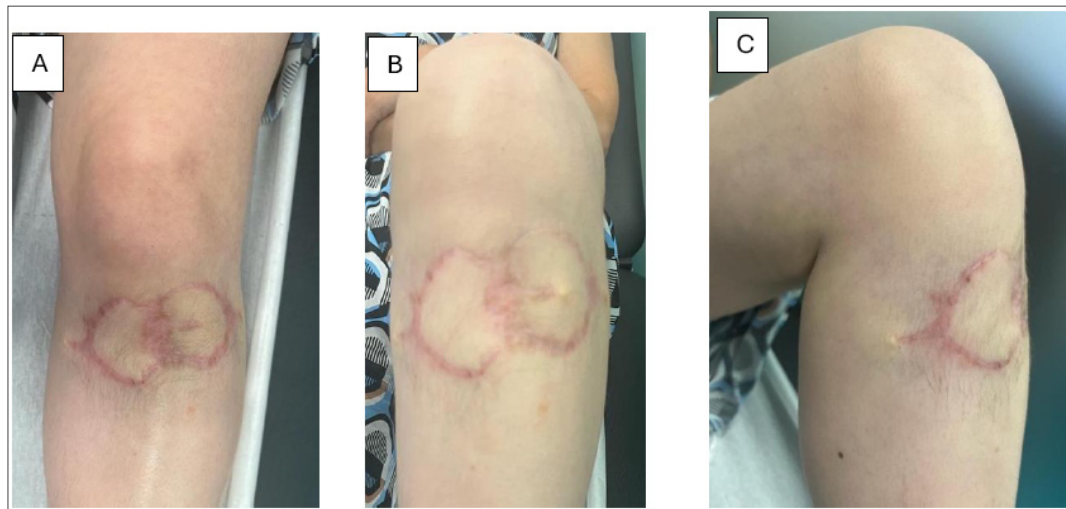


Figure 4. Keystone flap to cover a knee defect; A-C – post operative

Ankle

Ankle reconstruction is particularly challenging due to the joint's constant exposure to pressure and shear forces, as well as its relatively poor vascularity. Despite these challenges, however, the keystone flap provided stable coverage and achieved satisfactory functional and aesthetic results (Figure 5).

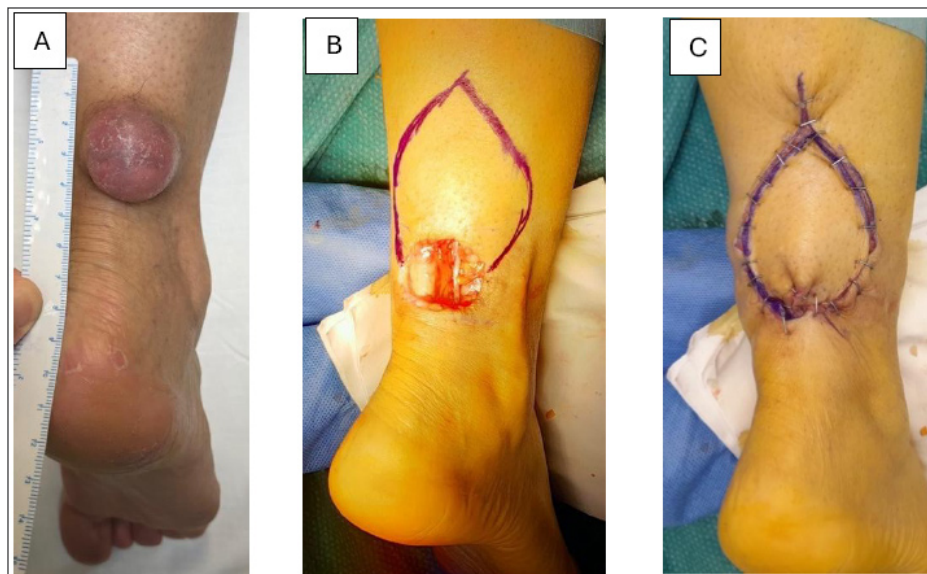


Figure 5. Keystone flap to cover an ankle defect; A – preoperative; B-C – intra operative.

DISCUSSION

Precise planning is required when reconstructing oncologic defects in periarticular regions, such as the neck, shoulder, elbow, knee and ankle, to ensure reliable tissue coverage, joint mobility preservation and minimal donor site morbidity (1, 6–8).

In this case series, we used the keystone flap technique to treat defects resulting from skin cancer resections in periarticular areas. All reconstructions resulted in the preservation of joint range of motion and acceptable

cosmetic outcomes, with no major postoperative complications. Only one patient experienced minor wound dehiscence, which resolved without the need for surgical revision.

The keystone flap avoids the need for microsurgical vessel anastomosis, lengthy operations, or intensive postoperative care (1, 4, 9). This translates into reduced costs, shorter hospital stays and lower complication rates, which is especially beneficial for elderly or comorbid patients (4). Furthermore, keystone flaps can often be performed under

local or regional anaesthesia, making them ideal for settings with limited resources or for ambulatory care (3,5).

CONCLUSION

The keystone flap is a reliable and versatile option for reconstructing moderate-sized oncologic defects in the periarticular region of anatomically complex areas such as the neck, shoulder, elbow, knee and ankle. It preserves joint function and aesthetics, minimizes donor site morbidity and can be used in an ambulatory setting. Due to its simplicity, adaptability and robust vascularity, the keystone flap should be considered the primary option in the planning of reconstructive surgery for high-risk periarticular defects.

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