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DESCENDING GENICULAR ARTERY PERFORATOR FLAP FOR ANTERIOR KNEE RECONSTRUCTION IN A CHILD WITH JUVENILE DERMATOMYOSITIS: CASE REPORT

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SUMMARY

Juvenile Dermatomyositis (JDM) is a rare systemic, autoimmune inflammatory muscle disorder and vasculopathy that affects children. It primarily affects skeletal muscles and skin, leading to poor wound healing. Soft-tissue defects around the knee in children often pose a reconstructive challenge due to limited local tissue and the functional importance of maintaining joint mobility. We present the case of a 9-year-old boy with JDM with a persistent wound on the anterior knee who we successfully managed surgically using a perforator flap from the descending genicular artery.

INTRODUCTION

JDM is a rare, serious autoimmune condition of childhood that involves small vessel vasculopathy, which typically affects skeletal muscle and skin [1,2]. Vasculopathy and chronic inflammation may predispose children to ulceration and delayed wound healing [3,4]. Reconstruction of anterior knee defects requires durable, pliable tissue that can tolerate early mobilisation [5]. Perforator flaps provide thin, well-vascularised coverage with minimal donor site morbidity and have gained increasing use around the knee region [6,8]. The descending genicular artery perforator (DGAP) flap offers a reliable option for anterior knee coverage, though its use in paediatric JDM patients is not widely reported.

LITERATURE REVIEW

Although perforator flaps for knee reconstruction are well described in adults and increasingly reported

in paediatric populations, literature specifically addressing reconstruction in children with juvenile dermatomyositis is extremely limited. Most reported paediatric knee reconstructions involve trauma, tumour resection, or infection in otherwise healthy children. Furthermore, JDM-associated wounds are typically managed conservatively, with few reports describing flap reconstruction in the setting of active or chronic vasculopathy (5,6). Compared to previously published paediatric perforator flap series, our case is distinct due to the underlying systemic vasculopathy and chronic immunosuppression, both of which increase the theoretical risk of flap compromise and delayed healing. Despite these risk factors, the DGAP flap demonstrated reliable perfusion, uneventful healing, and restoration of full knee function, supporting its use even in complex inflammatory conditions.

Table 1: Comparison of Paediatric Knee Reconstructions in Literature

Author (Year)	Patient Population	Defect Aetiology	Flap Type	Underlying Vasculopathy	Outcome
Grinsell et.al. (2014)	Paediatric patients	Trauma / infection	Various perforator flaps	No	Successful coverage, minimal donor morbidity
Hsieh et. al. (2023)	Mixed age group	Complex peripatellar defects	DGAP flap	No	Reliable coverage, good functional outcomes
Kim and Koh (2007)	Primarily adults	Knee defects	Perforator flaps	No	High flap survival rates
Present Case (2026)	9-year-old with JDM	Post-traumatic wound with SSI	DGAP flap	Yes (JDM)	Full flap survival, full ROM, hypertrophic scarring only

The descending genicular artery perforator (DGAP) flap is based on perforators arising from the descending genicular artery, a branch of the femoral artery that originates proximal to the adductor hiatus. The descending genicular artery typically divides into saphenous and articular branches. The saphenous branch travels distally within the intermuscular septum between the vastus medialis and sartorius muscles, accompanying the saphenous nerve and great saphenous vein, and gives off consistent musculocutaneous or septocutaneous perforators supplying the medial distal thigh and peripatellar skin. These perforators are usually located in the distal third of a line drawn from the anterior superior iliac spine to the medial femoral epicondyle. The DGAP flap can be designed as a propeller or island pedicled flap, providing thin, pliable, well-vascularised tissue with a reliable arc of rotation suitable for suprapatellar and peripatellar defects (5).

CASE PRESENTATION

A 9-year-old boy with a 5-year history of JDM with resolved calcinosis, managed on low-dose corticosteroids, methotrexate and rituximab, presented with a 6-week anterior left knee wound following a fall. The wound was initially closed primarily, but later developed a surgical site infection (SSI) and wound dehiscence. The wound progressively enlarged despite conservative dressings.

CLINICAL FINDINGS

The peripatellar wound measured approximately 6 x 5cm and demonstrated healthy granulation tissue. The surrounding skin exhibited hyperpigmentation without any signs of active local or systemic infection. There was mild limitation of knee motion due to discomfort. Laboratory investigations included a

complete blood count; urea and electrolytes, and liver function tests were all within normal limits.

Figure 1: Pre-operative appearance of peripatellar defect.



SURGICAL TECHNIQUE

Pre-operatively, a line was drawn from the anterior superior iliac spine (ASIS) to the medial epicondyle of the femur. The perforators of the descending genicular artery were located at the distal 1/3 of this line. A hand-held Doppler was used to localise these perforators. One perforator was identified, and the flap design and markings were made.

After general anaesthesia, the patient was positioned supine. The operative field was prepped and draped in a sterile manner. The defect was debrided and measured at 6 cm by 6 cm. The hip was abducted and externally rotated with the knee in slight flexion. Skin incision was made along the pre-marked outline. Subfascial dissection was carried out to identify the perforator arising from the descending genicular artery. The perforator was traced proximally through the intermuscular septum between the vastus medialis and sartorius muscles. The flap was islanded on the perforator, ensuring adequate pedicle length and arc of rotation. It was then tunneled beneath a skin bridge

to reach the defect, and the portion beneath the bridge was de-epithelialized. Flap inset was performed using interrupted non-absorbable sutures. A closed-suction drain was placed and secured.

Flap inset was performed using interrupted 4-0 nylon sutures. The donor site was closed primarily with interrupted 3-0 Vicryl® sutures to the deep dermal layer, followed by a continuous subcuticular 3-0 Monocryl® suture for skin closure. Sterile dressings were applied to both the donor and recipient sites.

Figure 2: Preoperative marking of perforator using a handheld doppler. A medial Sural artery flap was marked to be used as an alternative option.



Figures 3 and 4: Descending genicular artery perforator. Islanding and rotation of the flap.



Figures 5 and 6: Immediate postoperative anterior and medial views of the flap.



POST OPERATIVE COURSE

The flap remained well perfused with no evidence of venous congestion. Gentle mobilisation was initiated on postoperative day five. By two weeks, complete flap integration was observed. At 6 weeks and 4-month follow-up, the patient demonstrated full knee range of motion with stable soft-tissue coverage and no recurrence of ulceration. He developed hypertrophic scarring along the surgical site, which is currently being managed with silicone sheets and compression therapy. The patient has since resumed school and returned to his normal level of activity.

Figures 6 and 7: Four months post operative photo.



DISCUSSION

Andreas' algorithm for knee wound coverage proposes a pragmatic, anatomy-driven pathway that prioritises the least invasive effective option and escalates to more complex reconstruction only as dictated by depth, size, infection, and exposed structures. Superficial defects are managed with skin grafting—often aided by negative wound pressure therapy—while any exposure of patella, bone, or prosthesis mandates flap coverage. Small, noninfected defects (<4 cm) favour local skin or perforator flaps for thin, pliable, like-for-like coverage; perforator choices are guided by location (medial sural or freestyle propeller for suprapatellar/patellar, peroneal perforators for infrapatellar). Infected or deep wounds with dead space are best treated with pedicled muscle flaps—gastrocnemius (medial head for central/infrapatellar, lateral for lateral defects) being the reliable workhorse—while distally based sartorius or gracilis flaps serve suprapatellar or vascularly compromised situations. Moderate defects (4–6 cm) may be reconstructed with medial sural perforator (MSAP) flap or distally based anterolateral thigh (ALT) flaps, with muscle options (gastrocnemius, distally based vastus lateralis) when cavity filling is required. Large or limb-threatening defects (>6 cm) call for free tissue transfer, typically the ALT as a perforator or chimeric flap incorporating vastus lateralis, with vastus lateralis or latissimus dorsi reserved when ALT is unsuitable; recipient vessel selection is guided by preoperative vascular imaging, favouring local genicular or sural branches when available and the superficial femoral system when necessary. Above-knee amputation remains a last resort for uncontrollable sepsis or irreparable loss (5).

Children with JDM exhibit impaired wound healing due to chronic small vessel vasculopathy and immunosuppression (1,3,4). This makes local reconstructive options particularly valuable. Traditional methods—skin grafts, local muscle flaps, and cross-leg flaps—may be unsuitable for small anterior knee defects requiring thin, pliable tissue. The defect was moderate in size, peripatellar, and—after debridement—lacked a persistent deep cavity or exposed bone, so the algorithm directs care away from simple grafting and toward the least-morbidity flap that restores thin, pliable, like-for-like coverage (5). A local DGAP flap meets that requirement while preserving muscle and function. In a patient with JDM, chronic small-vessel vasculopathy, and immunosuppression, minimising operative complexity and donor-site sacrifice is essential, and a pedicled perforator with a short local pedicle reduces anastomotic risk compared with a free transfer.

Perforator flaps offer advantages, including minimal donor morbidity, preserved muscle function, like with like matching, and reliable vascularity (5). Several studies have described their use around the knee (6–9), including in paediatric patients (10,11). The DGAP balanced vascular reliability, functional preservation, and the algorithm's graded escalation of reconstructive complexity, making it a defensible, patient-centred choice.

Although hypertrophic scarring developed in this patient, there is no established evidence linking juvenile dermatomyositis directly to increased hypertrophic scar formation. The scarring is more likely attributable to mechanical tension at the knee joint, paediatric fibroproliferative response, and individual scar predisposition rather than the underlying autoimmune condition (3,8).

This case demonstrates that even in the setting of a vasculopathic condition such as JDM, perforator flaps can provide durable coverage with excellent functional outcomes.

CONCLUSION

The descending genicular artery DGA perforator flap is a reliable option for anterior knee reconstruction in paediatric patients, including those with compromised tissue quality due to juvenile dermatomyositis. It offers durable coverage and supports early mobilisation with minimal donorsite morbidity.

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