Case Report

Reverse digital artery flap for Pacinian hypertrophy of the fingertip: A rare case report

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\textbf{A B S T R A C T}

Pacinian corpuscle hyperplasia is a pathological increase in the size (Pacinian hypertrophy) and/or density of mature Pacinian corpuscles. Although its aetiology and pathogenesis remain unclear, surgery is the main treatment. Here, we report a rare case of Pacinian hypertrophy at the fingertip treated with surgical excision and reconstruction using a reverse digital artery flap. A 47-year-old man presented with injuries to his right little finger, which was wedged in a door while unloading a truck. His fingertip was amputated and stump plasty was performed. However, severe pain persisted at the fingertip for 5 months after the surgery. Therefore, the painful part of his fingertip was resected, and reconstruction was performed using a reverse digital artery flap 6 months after the injury. Haematoxylin and eosin staining of the resected specimen revealed scar tissue with foreign body reaction and mild Pacinian hypertrophy. One year has passed since the injury, and the pain has completely disappeared. The patient regained complete range of motion in his little finger and was able to resume work without any limitations. Surgical excision with sufficient margin and recon-

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Introduction

Pacinian corpuscles are rapidly adapting mechanoreceptors that respond to changes in pressure and vibration. They are located in the deep dermis and subcutaneous tissue, generally seen in the palmar and plantar skin and genitalia. Histologically, they consist of a central non-myelinated end-terminal axon and surrounding cells and fibrous capsule. Pacinian corpuscle hyperplasia is a pathological increase in the size and/or density of mature Pacinian corpuscles (Pacinian hypertrophy). The term Pacinian corpuscle hyperplasia is used interchangeably with Pacinian neuroma. Here, we report a rare case of Pacinian hypertrophy at the fingertip treated with surgical excision and reconstruction using a reverse digital artery flap.

Case report

This study was conducted in accordance with the standards of the Committee on Human Experimentation of the institution and was approved by the review board (approval no. 1249). The patient was given the option to opt out of having his data used for the study.

A 47-year-old man with right-hand dominance wedged his right little finger in a door while unloading a truck. He immediately consulted the emergency room at a nearby hospital. On presentation, fingertip amputation was deemed necessary and stump plasty was performed. Since then, he received treatment on an outpatient basis at a local hospital. However, severe pain persisted at the fingertip for 5 months after the surgery. Therefore, he was admitted to our hospital. On physical examination, severe pain on contact was observed on the volar side at the tip of his little finger (Fig. 1). Although his finger pulp was elastic and hard due to scar tissue, there was no swelling or mass. Radiographic examination showed a defect in half of the distal phalanx. Six months after the injury, the patient underwent resection of the painful part of the fingertip and reconstruction using a reverse digital artery flap (Fig. 2). First, the painful part of the fingertip marked before surgery was resected. Second, a flap was elevated from the radial border of the finger at the level of the proximal phalanx and transposed into the fingertip defect. The digital nerves were completely preserved. Further, the donor site was closed using a full-thickness skin graft from the volar side of the elbow. The resected specimen was sent for histopathological analysis. Haematoxylin and eosin staining revealed scar tissue with foreign body reaction and mild Pacinian hypertrophy (Fig. 3). Both the flap and the skin graft healed promptly without complications. It has been 1 year since the injury, and the pain has completely disappeared. The patient regained complete range of motion in his little finger (Fig. 4) and was able to resume work without any limitations. The disabilities of the arm, shoulder, and hand scores were 0.8 points.

Discussion

Pacinian corpuscle hyperplasia was first described by Patterson in 1956. Since then, 60 patients with Pacinian corpuscle hyperplasia of the hands and feet have been reported. Although the aetiology and pathogenesis of Pacinian corpuscle hyperplasia remain unclear, repetitive trauma has been implicated as a potential cause. Trauma has been hypothesized to disrupt the blood flow of arteriovenous anastomoses located close to Pacinian corpuscles, resulting in the formation of new corpuscles. Pain is the most common symptom and has been reported in 84.6% of patients. Pacinian corpuscle
hyperplasia is often related to the common digital nerve of the index, middle, and ring fingers, and only a few cases have been reported in the distal phalanx.\textsuperscript{7,8}

Surgery is the main treatment for Pacinian corpuscle hyperplasia. Stoj et al. reported that surgical excision resulted in resolution of symptoms in 76.9\% of patients and that only 52.3\% of patients who underwent surgery had a mass or swelling.\textsuperscript{4} In cases with clear mass, it may be possible to perform marginal excision for only affected lesions. However, in cases without clear mass, it is sometimes difficult to decide the extent of surgical excision required. Therefore, we believe that it is acceptable to perform radical debridement of scar tissue with sufficient margins to completely relieve the symptom, followed by reproduction of soft pulp using a flap.

In fingertip reconstruction, skin quality is of prime importance, and replacement should be done with skin harvested from the same finger to minimize damage to the donor site. There are some choices for fingertip reconstruction procedures, such as oblique triangular flap,\textsuperscript{9} Hueston flap,\textsuperscript{10} and reverse digital artery flap.\textsuperscript{2} Although the oblique triangular flap is a simple method for fingertip reconstruction, pain on contact may persist because the nerve stump may be located at the fingertip after flap transposition. Although the Hueston flap is versatile and easy to perform, the moving distance is limited. Therefore, we decided that the reverse digital artery flap was more suitable in our case. The reverse digital artery flap was first described in 1989 by Lai et al.\textsuperscript{2} The flap is pedicled at the centre of the middle phalanx and is based on reverse flow in the digital artery via a commun-
Figure 2. The patient underwent resection of the painful part of the fingertip (left) and reconstruction using a reverse digital artery flap. A flap was elevated from the radial border of the finger at the level of the proximal phalanx (centre) and transposed into the fingertip defect (right).

Figure 3. Haematoxylin and eosin staining revealed scar tissue with foreign body reaction and mild Pacinian hypertrophy.
Pain disappeared completely. The patient regained full range of motion in his little finger. The reverse digital artery flap can have a sufficient amount of tissue, avoid volar scarring, and facilitate immediate postoperative mobilization. The flap can also be innervated by raising the dorsal branch of the digital nerve along with the artery and coapting it to the terminal branches of the transected contralateral digital nerve. We decided that a non-sensory flap was a more reliable approach to completely relieve nerve-related intense pain, as in our case. To the best of our knowledge, this is the first case of Pacinian corpuscle hyperplasia at the fingertip treated with surgical excision and soft tissue reconstruction using a flap, which resulted in patient satisfaction and good function.

As this is a case report, there are several limitations, namely the lack of ability to generalize, danger of overinterpretation, and retrospective design. Therefore, further studies should consider the use of larger sample sizes.

**Conflict of interest**

None of the authors have any conflict of interest in relation to this work.

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**Guidelines**

This report was written in line with the STROBE guidelines.

**Ethical Approval**

This study was conducted in accordance with the standards of the Committee on Human Experimentation of the institution and was approved by the review board (approval no. 1249).
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