Carpal tunnel release is one of the most frequently performed surgical procedures in the field of hand and upper extremity surgery and is known to be very effective and safe, with low complication rates.\textsuperscript{1–3} Reported complications include injuries to the recurrent motor branch and palmar cutaneous branch of the median nerve, hypertrophic scar formation, pillar pain, laceration of the superficial palmar arterial arch, incomplete release of the transverse carpal ligament, tendon adhesion, wound infection, finger stiffness, and recurrence.\textsuperscript{1} The percentages of structural complications to nerves, arteries, or tendons have been reported to be less than 0.5%.\textsuperscript{2}

Epidermal inclusion cysts can result from various surgical procedures that lead to implantation of epidermal cells into deeper tissues under the dermis, but there are few reports of postoperative occurrences of epidermal inclusion cysts in the hand and wrist. To the best of our knowledge, an epidermal inclusion cyst caused by carpal tunnel release has been described only once before.\textsuperscript{4}

Here we describe a case of epidermal inclusion cyst that occurred after carpal tunnel release. The aim of this report is to introduce this rare complication of carpal tunnel release and emphasize the importance of basic surgical skills, such as gentle handling of a surgical wound, profuse saline irrigation, and careful wound closure with precise approximation of skin edges.

\textbf{Case Report}

A 44-year-old, right-handed man presented with a 1-year history of bilateral (left hand greater than right hand) numbness and pain in the median nerve distribution. Symptoms had aggravated in the 3 months prior to presentation. Electromyography and nerve conduction studies indicated...
bilateral median neuropathies at the wrist with more severe involvement of the left side. We performed mini-open carpal tunnel release on the left side as usual, and the surgical wound was closed with vertical mattress sutures of 3–0 nylon. The postoperative course was uneventful, and the patient stopped follow-up visits with complete resolution of his symptoms 4 months after the surgery. However, 20 months after surgery, he revisited with complaints of a palpable mass at the previous operation site and a tingling sensation in the medial nerve distribution. The mass grew insidiously, and he denied any traumatic episode involving the left hand or wrist after the previous operation. Physical examination revealed a mass beneath the previous operation scar (Fig. 1). The mass was palpable and firm without signs of infection and had a positive Tinel sign. Ultrasonography demonstrated a 1.0 × 0.8-cm round, well-demarcated, irregular echogenic soft tissue mass under the dermis (Fig. 2).

We decided to perform surgical exploration and made a 2-cm skin incision along the previous operation scar. A shiny, white, well-demarcated round mass was found in the subcutaneous tissue layer (Fig. 3). The mass was easily pulled out. The wound was copiously irrigated and then closed with vertical mattress sutures of 3–0 nylon. Histological examination

![Fig. 1 Preoperative photographs showing an oval, firm, protruding mass on the scar of the previous carpal tunnel release.](image)

![Fig. 2 Ultrasonography showing a round, well-demarcated, irregular echogenic mass under the dermis.](image)

![Fig. 3 Intraoperative photographs showing a well-demarcated, round whitish yellow mass.](image)

![Fig. 4 Photomicrographs of biopsy specimen demonstrating stratified squamous cell epithelial lining and eosinophilic keratin debris in the cystic cavity. (a) Hematoxylin-eosin stain, magnification x10. (b) Magnification x 100.](image)
confirmed the diagnosis of an epidermal inclusion cyst
(►Fig. 4). The patient had an uneventful postoperative course, and
his preoperative symptoms disappeared. Six months
following the excision, there was no evidence of recurrence
and the patient remained free of symptoms.

Discussion

Epidermal inclusion cysts, also known as epidermoid in-
cclusion cysts, epidermal cysts, epithelial cysts, keratin
cysts, implantation cysts, infundibular cysts, or sebaceous
cysts, are unicellular cysts without septation that are en-
capsulated with fibrous tissue and lined by true epidermis,
which is stratified, keratinized squamous epithelium with a
granular layer as found on the skin surface and in the
infundibulum of hair follicles. Because these cysts do not
involve sebaceous glands and do not contain sebum, the
term “sebaceous cyst” is a misnomer.5 The cysts contain
central, eosinophilic, keratinaceous material comprising
accumulations of cutaneous products, the debris of keratin,
proteins, cholesterol, and cell membrane lipids. The con-
tents usually look like a chunk of cheese and have a foul
smell. Cysts can be skin-colored, yellow, or white and are
usually slow-growing and asymptomatic. However, poly-
 microbial infection of cysts with aerobic or anaerobic
organisms may occur, and malignant transformation, al-
though very rare, has been reported.6 Epidermal inclusion
cysts are, strictly speaking, epidermoid cysts of traumatic
origin.7 The proposed mechanisms of development of epi-
dermoid cysts include incomplete cleavage of cutaneous
dermis at the embryonic stage, squamous metaplasia of
the columnar epithelial cells within dilated ducts, down-
ward growth of epidermal cells with inflammation after
obstruction of the hair follicle, human papillomavirus
infection, and growth of implanted fragments of the epi-
dermis within deep tissue after trauma or surgical proce-
dures.4,5,8,9 Epidermoid cysts of nontraumatic origin are
commonly located on hair-bearing areas of the upper chest,
upper back, neck or head, while epidermoid cysts of trau-
matic origin—epidermal inclusion cysts—are more com-
on nonfollicular areas such as the palms, soles, or
buttocks.

Epidermal inclusion cysts are the third most common type
of tumor of the hand, after ganglion cysts and giant cell tumors
of the tendon sheath.10 They are more frequently seen in male
manual laborers who are subject to repeated minor trauma to
the hand. They are usually located in the dermis or subcute-
aneous tissue layer of the volar surface, especially the distal
portion of the digits, as a solitary lesion. However, multiple
lesions and deep tissue involvement, such as tendon and bone,
have been reported also.11,12 Lincoski et al8 reported the
largest series of epidermal inclusion cysts of the hand. They
experienced 101 cysts (94 patients) among 623 hand tumors
(16%) over a period of 27 years. Of these patients, 83% were
male and 56% were manual laborers. Mean age was 46 years
old. Forty-eight percent recalled a definite traumatic event
prior to cyst development, and three cases had cysts that
occurred after prior unrelated surgery. However, detailed
information about the nature of previous operations was not
provided. Seventy-two cysts (71%) were located on the volar
surface. Four cysts (0.04%) were intraosseous, and four cases
(0.04%) were multiple. There were 11 cases (11%) of recur-
rence. Lucas13 also reported 58 patients (60 cases) with
epidermal inclusion cysts of the hand. In that study, 85%
were male (49 patients), and 91% (53 patients) were manual
laborers. Forty-seven percent (27 patients) recalled a traum-
ic event. Cysts were intraosseous in two patients (0.03%), and
recurrence occurred in 10 patients (17%).

Although repeated minor trauma is a frequent cause of
epidermal inclusion cysts in the hand, postoperative occur-
rence of epidermal inclusion cysts in the hand has been rarely
reported. We found only two cases in the English-language
medical literature.4,14 One was due to dermofasciectomy and
full-thickness skin graft to treat Dupuytren’s contracture.14
while the other was due to mini-open carpal tunnel release.4
Low et al4 presented a case of epidermal inclusion cyst after
carpal tunnel release and presumed that subcuticular suture
with braided polyglactin implanted epidermal tissue into the
deep tissue. In our case, we had closed the operation wound
with vertical mattress sutures of 3–0 monofilament nylon. It
is therefore unclear how epidermal tissue was implanted in
our case.

As mentioned previously, all kinds of surgical and invasive
procedures can induce epidermal inclusion cysts. To prevent
development of epidermal inclusion cysts, surgeons should
use a fresh, sharp scalpel and should be careful not to make
impressions of skin edges.7 Moreover, when sharp instru-
ments or powered instruments are used, surgeons should be
careful not to push epithelium into the deeper tissues. Profuse
irrigation of the operation wound is also important to wash
out epithelial debris.7 Although carpal tunnel release is a
relatively safe procedure and is widely performed, surgeons
have to keep in mind these recommendations to prevent the
occurrence of epidermal inclusion cysts.

Conflict of Interest
None.

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