

Extensive Abdominal Wall Incisional Heterotopic Ossification Reconstructed with Component Separation and Strattice Inlay

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Summary: Symptomatic heterotopic ossification of abdominal surgical incisions is a rare occurrence. We present a 67-year-old man with severe discomfort caused by heterotopic ossification extending from the xiphoid to the umbilicus. The patient underwent an abdominal aortic aneurysm repair 3 years before our treatment. A 13×3.5 cm ossified lesion was excised. The resulting midline defect was closed using component separation and inlay Strattice. Tension-free midline adaptation of the recti muscles was achieved. A computed tomography scan of the abdomen 6 months after the surgery showed no recurrence or hernias. Heterotopic ossification in symptomatic patients has previously been treated with excision and primary closure. We believe that tension-free repair is important to prevent recurrence. Acellular dermal matrix may add to this effect and also compartmentalize the process. (*Plast Reconstr Surg Glob Open* 2016;4:e816; doi: 10.1097/GOX.0000000000000814; Published online 21 July 2016.)

Postoperative calcifications are visible in up to 25.7% of postoperative abdominal computed tomography (CT) scans of midline incisions.¹ There is a predilection for upper midline incisions; however, symptomatic heterotopic ossification of the abdominal wall seems to be much less common, with only single cases and small case series reported.²⁻⁵

Heterotopic ossification is known by many names: myositis ossificans circumscripta, ossifying pseudotumor, fibrodysplasia ossificans traumatica, neurogenic ossifying fibromyopathy, etc.² Osseous histological structure differentiates it from heterotopic calcification. The cause of heterotopic ossification is unknown, but 2 main theories exist: seeding of periosteal cells from nearby structures such as the xiphoid into the wound or osseous differentiation from pluripotent mesenchymal cell.^{3,6} Increasing evidence suggests that pericytes, the smooth muscle cells enwrapping microvascular endothelial cells, behave like mesenchymal stromal cells

and can be the source of osteogenic cells in heterotopic ossification.⁷

So far, recommendations for treatment have been excision and primary closure^{2,4} with the possible addition of radiation treatment in the case of recurrence.³

CASE REPORT

A 67-year-old man with a calcified process in a previous midline abdominal incision was referred to us from an outside hospital.

The patient had previously been successfully treated with open elective surgery for an infrarenal aortic aneurysm. Two months after the otherwise uneventful surgery, the patient noticed pain, discomfort, and stiffness of the abdominal wall, which was exacerbated by flexion of the hip. He also had a hypertrophic scar with considerable pruritus. An attempt at resection was done at the community hospital, but the surgery was abandoned when the surgeon was faced with the extent of ossification. The patient was then referred to the largest tertiary care center in Norway but was deemed untreatable at that institution. Three years later, he was referred to us. The patient was now in constant pain, dependent on high-dose narcotics, and could not sit or perform activities of daily life. A CT scan was obtained that showed a 15×4-cm calcified lesion extending from the xiphoid to just above the umbilicus where an incisional hernia was found (Fig. 1). The cal-

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cification was located 1 mm away from the lumen of the transverse colon at the closest point.

Hyperparathyroidism and hypercalcemia were ruled out with appropriate tests. The patient was brought to the operating room where the heterotopic ossification was found to transgress the peritoneum in its inferior extent. Careful lysis of adhesions allowed the specimen to be removed without any enterotomies (Fig. 2). All steps of the procedure were performed by the senior author. Superiorly at the native xiphoid, a fracture line was noted. The specimen measured 13×3.5 cm. An extended component separation sparing the periumbilical perforators was performed to achieve tension-free midline apposition of the recti muscles (Fig. 3). An inlay Strattice mesh (LifeCell, USA) was placed in the preperitoneal plane using a parachute technique (Fig. 4).

The patient refrained from heavy lifting for 8 weeks and used an abdominal binder for the same amount of time. At 12 months postoperatively, the patient was free from pain and could participate in all and any activities of daily life. No recurrences or hernias were found on the CT scan at 6 months.

DISCUSSION

It seems unlikely that the theory of periosteal seeding is correct, seeing that incisions not involving the xiphoid process or the pubic bone can still develop heterotopic ossification.⁸ Pluripotent mesenchymal cells located in an embryological fusion line with multifactorial induction factors causing heterotopic ossification seem more likely. It has been suggested that, for example, inflammatory responses induce mesenchymal cells to differentiate into osteoblasts or chondroblast in a process known as osteogenic induction.³

The optimal treatment of patients with abdominal heterotopic ossification remains unknown. So far, the recommendation has been excision and primary closure, with the addition of postoperative radiation in the case of a recurrence. The exact incidence of recurrence is unknown, but 33% is reported in Reardon's case series.³

We believe that reconstruction after heterotopic ossification resection requires an approach similar to reconstruction of the complex abdominal wall with tension-free and reinforced repairs.⁹ Research has shown lately that mechanical stress is a factor of importance in the differentiation of pluripotent stem cells into bone tissue or other tissues.^{10,11} Heterotopic ossification, just like hernias, is much less common in transverse than midline incisions¹; this is, in our opinion, likely because of lesser tension in the wound. We believe that a tension-free closure is of importance not only to prevent hernias but also to prevent heterotopic ossification, and we recommend component separation as part of the treatment. The use of Strattice further reinforces the reconstruction.

In breast reconstruction, the use of acellular dermal matrix (ADM) has been shown to decrease capsular contracture,¹² and it may act as a modifier of inflammatory reaction, by acting as an interface or a barrier. The creation of a barrier between the resected area and the peritoneal cavity in the case of abdominal heterotopic ossification is also favorable in our opinion.



Fig. 1. Preoperative CT scan.



Fig. 2. Dissected heterotopic ossification.

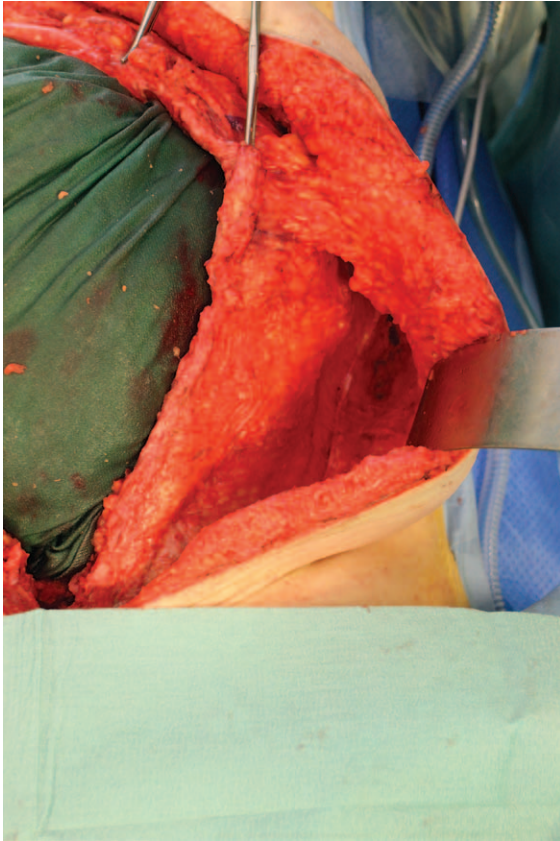


Fig. 3. Extended component separation with spared periumbilical perforators.

Tam et al described a single case with isolated heterotopic ossification of ADM in the aftermaths of a complicated abdominal wall reconstruction. The heterotopic ossification was resected and reconstructed with ADM again. There was no recurrence at 6 months.⁵ No other cases with heterotopic ossification in patients with ADM reconstruction have been described.

Because of the serious side effects of radiation, we do not recommend it as part of the treatment. The effects of steroids and nonsteroidal antiinflammatory drugs are uncertain.⁵

In the field of orthopedic surgery, heterotopic ossification is rather common, and we hope that more about the cause and treatment of this, sometimes disabling, medical problem can be elucidated in that field.

We conclude that the use of component separation and inlay Stratice reconstruction seems safe and efficient in the treatment of heterotopic ossification of abdominal wall incisions.

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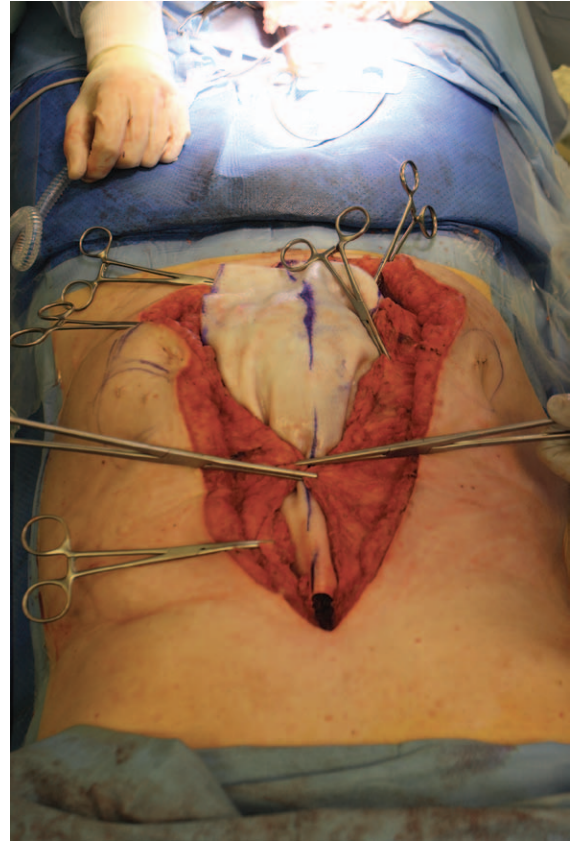


Fig. 4. Inlay Stratice in the preperitoneal plane.

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