Artificial Acellular Dermal Matrix Presenting as a Nodule in Thyroidectomy Patient

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ABSTRACT

Postoperative adhesion after total thyroidectomy induces discomfort such as pain, hyperesthesia of anterior neck and swallowing difficulty. To prevent postoperative adhesion, various anti-adhesion barriers were introduced. Adhesion barrier is generally considered to be well tolerable and safe, however few cases of delayed adverse effects are reported. Persistent adhesion barrier agent on operation site is one of the rare complications. This study aimed to review the literature, and discuss the etiology and management of persistent artificial acellular dermal matrix (ADM) after thyroidectomy. Herein, we presented a case who presented as a nodule after applying artificial ADM which lasted 32 month post-thyroidectomy. A 64-year-old woman underwent left hemi thyroidectomy and ipsilateral central compartment node dissection (CCND) for papillary thyroid carcinoma (PTC). Seven months later operation, her neck ultrasonography (US) revealed a hypoechoic mass on left operation bed, which was suspicious for recurred mass, granulation tissue or neuroma. After excision of mass, the final histopathologic diagnosis was rolled ADM.

Keywords: Carcinoma; Papillary; Thyroid

INTRODUCTION

The incidence of thyroid cancer has increased during the last few decades in Korea (1). The cause of increasing incidence of thyroid cancer is due to the increased detection of small papillary cancers and improvement in the detection method. Even though, various techniques for thyroid surgery have been introduced, traditional open thyroidectomy using trans-cervical approach is still choice of surgery for many endocrine surgeons. However several complications of thyroidectomy especially using trans-cervical approach are reported and one of them is postoperative adhesion. Adhesion between strap muscle, subcutaneous fatty tissue and skin induces discomfort such as pain, hyperesthesia of anterior neck and swallowing difficulty. To prevent adhesion, various adhesion barriers were introduced including artificial acellular dermal matrix (ADM). ADM is an acellularized extracellular matrix that has been used for prevention of adhesion formation, aiding in wound healing and soft tissue augmentation (2). To date, very few cases of delayed adverse effects including persistent adhesion barrier have been reported after use of ADM. Herein, we present a case of persistent ADM in the surgical bed on a patient who underwent thyroidectomy via trans-cervical approach.
CASE REPORT

A 64-year-old woman visited hospital for screening purpose of thyroid gland on May, 2014. She had no specific symptoms or family history of thyroid cancer. Ultrasonography (US) examination revealed 0.6 cm sized oval hypoechoic nodule on her left upper pole and multiple benign looking nodules on both thyroid glands. Result of fine needle aspiration biopsy (FNAB) of the left thyroid lesion was atypia of undetermined significance. She underwent left hemithyroidectomy on July, 2014 and intraoperative frozen biopsy confirmed that the lesion was papillary thyroid carcinoma (PTC). She then underwent ipsilateral central compartment node dissection (CCND). Before closing strap muscle, we inserted ADM (MegaDerm, L&C BIO Inc., Seongnam, Korea) underneath strap muscles and upon trachea and operation bed. We inserted ADM as flat form and it was not fixed to adjacent tissue. The final histopathologic result reported that she had a 0.6 cm sized PTC without lymph node metastasis. She was administered levothyroxine after thyroidectomy, for hormonal replacement and thyroid stimulating hormone (TSH) suppression. Seven months after surgery, neck US showed a 10 mm sized hypoechoic lesion which was located between left thyroid operation bed and isthmus. It was suspicious for organizing hematoma or postoperative change. The surgeon recommended to follow up the lesion with short-term interval and to remove surgically when the lesion get enlarged or acquires suspicious features. Other than this lesion, there were no signs of recurrence on US, serum thyroglobulin level and chest computed tomography.

On February, 2017, 31 month after surgery, she presented with palpable anterior neck mass. Neck US revealed 1.6 cm sized ill-defined hypoechoic mass on left thyroid operation bed and it was suspicious for recurred mass, granulation tissue or neuroma (Fig. 1). She underwent excisional biopsy under general anesthesia and soft tissue was located under strap muscle and anterior to trachea intraoperatively (Fig. 2). The location was concordant with our usual insertion site of MegaDerm. There were no complications postoperatively. The histopathological examination showed rolled ADM (Fig. 3). One year after excision, she had no sign or symptom of remnant mass.

Fig. 1. Ultrasonographic image of artificial ADM. (A) Ultrasonographic image showed a hypoechoic mass on the left thyroid operation bed, which is 1.5×1.6 cm in size on transverse view (arrow). (B) A hypoechoic mass was located under strap muscle on longitudinal view (arrow).
ADM = acellular dermal matrix.
DISCUSSION

After thyroidectomy, complications including neck discomfort such as pain, hyperesthesia and adhesion, were reported. The thyroid gland works as a physical barrier between trachea, strap muscle and skin (3). An ADM is an allogenic material which was produced as dermal substitute for skin defects and as a preventive agent for postoperative scars or adhesions (2). MegaDerm is a recently introduced ADM which involves the cross-linking of collagen and improves tensile strength and durability (4). Durability of MegaDerm is known to be approximately 6 months, after then it is incorporated into the surrounding soft tissues (5). Because of superior biocompatibility and biodegradability, adverse effects from use of anti-adhesion or hemostat agent are rarely reported. Majority of adverse effects were foreign body reaction such as granuloma formation or bacterial infection (6,7). In theory, ADM maintains fibrosis during wound healing process, prevent excessive scar formation and inflammation then absorbs into surrounding tissues. There are not many explanations why ADM does not absorbed, instead persisted as a rolled mass. There are a few hypotheses for this unusual case. First, poor incorporation of implanted ADM may lead to persistent ADM (5). The process of wound healing such as angiogenesis and remodeling are involved in host tissue incorporation, after ADM implantation (8). Lee et al. (5) found that the organized collagen and elastin fibers of the ADM were replaced with dense collagen and elastin fibers 6 months after implantation. In addition, they found that density of microvessel increased 6 months after implantation, indicating long-term remodeling of the extracellular matrix (ECM) in implanted cross-linked human ADM (5). In their article, mRNA levels of type I collagen, transforming growth factor-β, matrix metalloproteinase (MMP)-1 and MMP-9 were also

Fig. 2. Gross image of artificial ADM. Artificial ADM had initially whitish to yellow colored sleek cut surface. After stained with green dye, cut surface of mass was shown in greenish color (bar=1 cm). ADM = acellular dermal matrix.

Fig. 3. Histopathologic result of artificial ADM. (A) H&E staining showed well defined, nodular connective tissue (×12.5). (B) H&E staining depicted increased collagenous bundles in the nodular lesion (×40). (C) Blue colored collagenous bundles are arranged haphazardly (Masson’s trichrome stain, ×40). ADM = acellular dermal matrix; H&E = hematoxylin and eosin.
elevated 3 months after implantation. After then, ADM was eventually replaced with host collagen, therefore successful incorporation of the ADM into the surrounding tissue in early stage was important (9).

The disintegration of the cross-linked product of ADM may provoke persistence of ADM. To avoid this complication, a future trial to demonstrate the most effective size and thickness of ADM should be performed. ADM also should be placed carefully into the space between strap muscle and trachea to prevent dislocation.

In summary, we report a rare case of persistent ADM presenting as a nodule postoperatively. We recommend the surgeons should always consider potential complication of foreign body.

REFERENCES