Plastic Surgery in Patients with Umbilical Lesions: A Case Series

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ABSTRACT

Since the umbilicus is located on the surface of the body, many patients visit plastic surgeons for concerns regarding umbilical disorders. We performed a retrospective review of our clinical cases to characterize the types of umbilical lesions treated by plastic surgeons. The majority of lesions that we treated were common in the field of plastic surgery, such as umbilical hernia, skin tumors, and omphalitis with urachal remnants. However, there was a peculiar case of a patient who presented with rectal cancer with umbilical metastases. Metastasis of a visceral malignancy to the umbilicus is known as Sister Mary Joseph’s nodule, and it is associated with a poor prognosis. The patient presented with gastrointestinal perforation at the time of initial examination, indicating that some patients who visit plastic surgeons for umbilical lesions may require immediate medical treatment. While urachal remnants are common cystic lesions of the umbilicus, there are some rare cases of patients who present with remnants of the umbilical artery. We also examined the incidence of umbilical artery remnants. Here, we report cases of patients with umbilical lesions in order to identify rare lesions that may otherwise be missed during regular clinical examinations.

Key words: Sister Mary Joseph’s nodule, umbilical artery remnant, umbilicus, urachal remnant

Introduction

Since the umbilicus is located on the surface of the body, many patients visit plastic surgeons for concerns with umbilical disorders. Patients commonly present with umbilical hernia, skin tumors, and omphalitis with urachal remnants; however, there are certain cases that can be difficult to diagnose at the time of the initial examination. Since the umbilicus is a thin structure that exists between the surface of the body and the peritoneum, it is known to reflect the physiology of the peritoneum. As the umbilical artery and the urachus connect the mother and fetus during the fetal period, the umbilicus consists of various types of tissues. This characteristic makes the umbilicus a site from which various complex pathologies arise. Such pathologies include malignancies that may be life-threatening unless treated early, as well as other diseases that require careful diagnosis. In cases of the latter, accurate diagnosis is critical to determine the appropriate surgical approach to prevent harmful interactions with the intraperitoneal organs. Therefore, it is important for plastic surgeons to gain in-depth knowledge about the developmental processes and pathologies of the umbilicus. We performed a retrospective review of patients who visited our clinic for umbilical lesions to identify rare lesions that may otherwise be missed during regular clinical examinations.

Methods

All patients who visited our department with a chief complaint of umbilical lesions between 2008 and 2018 were included. The following variables were examined: age, sex, type of lesions, treatments administered at our department, and pathological findings.

Results

We included a total of 32 patients (15 men, 17 women) having a mean age of 32 years (range: 0-67 years) at the time of the initial examination. Type of lesions that the patients...
presented with included umbilical hernia (n=11), skin tumors (n=8), omphalitis with urachal remnants (n=4), hypertrophic scar as a result of laparoscopic surgery (n=4), umbilical deformity as a result of surgery other than plastic surgery (n=2), dirt buildup in the umbilicus (n=1), rectal cancer with umbilicus metastases (Sister Mary Joseph’s nodules) (n=1), and infected urachal cyst with umbilical artery remnants (n=1). Among those with umbilical hernia, 4 were only followed-up as they did not wish to undergo surgery, 5 underwent surgery, and 2 were referred to another hospital.

Four patients with skin tumors had infections and were treated with either antibiotics or incision and drainage. Four patients underwent tumor resection. Pathological diagnoses of these tumors were epidermal cyst (n=1), hypertrophic scar tissue due to epidermal cyst infection (n=2), and granulation tissue (n=1). Umbilicoplasty was performed in patients who had umbilical deformity due to a previous surgery. Patients who had hypertrophic scars at the port site, as a result of laparoscopic surgery, were treated with surgical resection of the scar tissue or by topical steroids. Among patients who developed omphalitis with urachal remnants, 2 patients were treated with surgical resection. Both patients had urachal remnants with umbilical urachal sinus, as categorized by the Blichert-Toft classification. Patients with dirt buildup in the umbilicus underwent washing procedures as outpatients and were given bathing instructions. The patient who developed an infected urachal cyst with umbilical artery remnants underwent surgery with an initial diagnosis of omphalitis with urachal remnants. However, based on intraoperative and postoperative pathological findings, the patient was diagnosed with an infected urachal cyst with umbilical artery remnants. The patient with metastasis of rectal cancer to the abdominal wall presented with gastrointestinal perforation at the time of initial examination at our clinic and was subsequently transferred to our surgical department on the same day to undergo emergency surgery. Given that the cases were relatively rare, we discuss pathological findings, the patient was diagnosed with an infected urachal cyst with umbilical artery remnants (Table 1). Among those with umbilical hernia, 4 were only followed-up as they did not wish to undergo surgery, 5 underwent surgery, and 2 were referred to another hospital.

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**Case 31: A 45-year-old woman**

History of present illness: The patient became aware of swelling and redness around her umbilicus over a week prior to the visit to our department. Two days prior to her visit to our department, she visited her local clinic for general malaise and fever in the 39-degree range. A mass was identified in the umbilical region, and she was referred to our department. During the initial examination, a granuloma-like mass measuring approximately 2 cm in diameter was identified in the umbilical region (Fig. 1). She did not have abdominal tenderness or pain around the mass. The development of fever could not be explained by the local findings of the umbilical region alone; thus, blood tests and contrast computed tomography (CT) were performed. Findings from the blood tests revealed anemia and a prolonged coagulation time (WBC count: 10,100 /µL, RBC count: 306 × 10⁶ /µL, Hb: 6.0 g/dL, Ht: 21.1%, MCV: 69.0 fl, Plt count: 25.0 × 10⁹ / µL, PDW: 21.2%, PT: 15.0 sec, APTT: 44.0 sec). Contrast CT showed a mass in the umbilical region that protruded from the skin and extended into the peritoneum (Fig. 2). It also showed bowel wall thickening from the rectal junction to the rectum as well as enlargement of the uterus. Since there was free air, pelvic abscess and rectal perforation due to rectal cancer were suspected. Given these findings, an emergency open colostomy was performed on the same day. Biopsy of the rectal lesion confirmed that the lesion was a tubular adenocarcinoma. Based on the imaging and pathological findings, the patient was diagnosed with stage IV rectal cancer (T4b, N1, M1), with invasion into the cervix and metastasis to the skin. She subsequently underwent open low anterior resection, D3 lymphadenectomy, resection of uterine appendages, and temporary ileostomy, followed by adjuvant chemotherapy. The mass that was resected from the umbilical region was a moderately differentiated tubular adenocarcinoma with necrotic and fibrous tissues that formed irregularly shaped duct glands (Fig. 3). Two years after the procedure, she continued to visit our hospital as an outpatient.

**Case 32: A 23-year-old man**

History of present illness: The patient visited a urology clinic, with a chief complaint of abdominal pain and protrusion of the umbilical region. Umbilical discharge was observed, and the patient was referred to our department. The initial examination demonstrated abdominal tenderness and a mass present in the middle of the umbilicus (Fig. 4). Antibiotics were administered and incision and drainage were performed to improve the local symptoms. Abdominal contrast CT revealed an area with low absorption, with pericapsular contrast from the subcutaneous tissue into the abdominal wall (Fig. 5). This area of low absorption did not extend from the umbilicus to the bladder. Based on the location and type of contrast enhancement, urachal abscess was suspected. Since incision and drainage did not improve the symptoms of abdominal pain, surgery was performed (Fig. 6). The cyst extended from the umbilicus into the subcutaneous tissue, and the cyst wall had luminal structures that extended to just below the abdominal wall. To confirm these findings, a lower abdominal midline incision was made. The tubular tissue found along the cyst wall had split and extended laterally from the base of the cysts to the caudal portion. This structure was found around the exterior of the bladder that appeared fibrous and was ligated and resected at this location. It did not extend into the bladder, and the dome of the bladder appeared normal (Fig. 6). Pathological examination further revealed that this tissue consisted of...
| Case | Age | Sex  | Type of lesion          | Origin of referral      | Treatment                                      | Pathology                          |
|------|-----|------|-------------------------|-------------------------|-----------------------------------------------|------------------------------------|
| 1    | 5   | Female | Umbilical hernia         | Pediatrics              | No surgery                                    |                                   |
| 2    | 67  | Male  | Umbilical hernia         | Surgery                 | No surgery                                    |                                   |
| 3    | 0   | Female | Umbilical hernia         | Plastic Surgery         | No surgery                                    |                                   |
| 4    | 5   | Female | Umbilical hernia         | Pediatrics              | No surgery                                    |                                   |
| 5    | 1   | Female | Umbilical hernia         | Dermatology             | Surgery (umbilicoplasty)                      |                                   |
| 6    | 22  | Male  | Umbilical hernia         | No referral             | Surgery (umbilicoplasty)                      |                                   |
| 7    | 5   | Male  | Umbilical hernia         | Surgery                 | Surgery (umbilicoplasty)                      |                                   |
| 8    | 30  | Male  | Umbilical hernia         | Surgery                 | Surgery (umbilicoplasty)                      |                                   |
| 9    | 57  | Female | Umbilical hernia         | Surgery                 | Surgery (umbilicoplasty)                      |                                   |
| 10   | 0   | Female | Umbilical hernia         | City office (medical examination) | Refer to another hospital                     |                                   |
| 11   | 1   | Female | Umbilical hernia         | Pediatrician            | Refer to another hospital                     |                                   |
| 12   | 29  | Female | Skin tumor (infected)    | Emergency               | Incision and drainage, followed by resection | Hypertrophic scar                 |
| 13   | 55  | Male  | Skin tumor (infected)    | Emergency               | Incision and drainage, followed by resection | Granulation tissue                |
| 14   | 31  | Male  | Skin tumor (infected)    | Dermatology             | Antibiotics                                   |                                   |
| 15   | 31  | Male  | Skin tumor (infected)    | Emergency               | Incision and drainage                         |                                   |
| 16   | 20  | Male  | Skin tumor              | Urology                 | Surgery (resection)                           | Epidermal cyst                    |
| 17   | 23  | Male  | Skin tumor              | Surgery                 | Surgery (resection)                           | Hypertrophic scar                 |
| 18   | 59  | Male  | Skin tumor              | Dermatology             | Watchful waiting                              |                                   |
| 19   | 37  | Female | Skin tumor              | Dermatology             | Watchful waiting                              |                                   |
| 20   | 53  | Male  | Postoperative umbilical deformity | Surgery | Surgery (umbilicoplasty)                      |                                   |
| 21   | 32  | Male  | Postoperative umbilical deformity | Surgery | Surgery (umbilicoplasty)                      |                                   |
| 22   | 49  | Female | Hypertrophic scar from laparoscopy | No referral | Surgery (resection)                           | Hypertrophic scar                 |
| 23   | 58  | Female | Hypertrophic scar from laparoscopy | Surgery | Surgery (resection)                           | Hypertrophic scar                 |
| 24   | 35  | Female | Hypertrophic scar from laparoscopy | Obstetrics and gynecology | Surgery (resection)                           | Hypertrophic scar                 |
| 25   | 36  | Female | Hypertrophic scar from laparoscopy | Plastic Surgery | Topical steroid                                |                                   |
| 26   | 48  | Female | Omphalitis with urachal remnants | Urology | Surgery (resection)                           | Urachal remnant                   |
| 27   | 17  | Male  | Omphalitis with urachal remnants | Emergency | Surgery (resection)                           | Urachal remnant                   |
| 28   | 58  | Male  | Omphalitis with urachal remnants | Surgery | Antibiotics                                   |                                   |
| 29   | 25  | Male  | Omphalitis with urachal remnants | Urology | Antibiotics                                   |                                   |
| 30   | 59  | Female | dirt buildup in the umbilicus | Surgery | washing procedure and bathing instruction      |                                   |
| 31   | 45  | Female | Rectal cancer with abdominal wall metastases | Internal medicine clinic | Surgery (resection)                           | Abdominal wall metastasis of cancer/differentiated tubular adenocarcinoma |
| 32   | 23  | Male  | Omphalitis with umbilical artery remnants | Emergency | Surgery (resection)                           | umbilical artery remnants consisted of circular muscles |
circular muscles and that there was blood inside the lumen (Fig. 7). At 6 months after the procedure, the patient did not have any pain or recurrence of the disease (Fig. 8).

Discussion

Since the umbilicus is located on the surface of the body, many patients visit plastic surgeons for concerns with umbilical disorders. The umbilicus is a scar tissue that results from the connection formed between the urachus and the umbilical artery with the abdominal wall during the fetal period. It lacks skeletal muscles and subcutaneous tissues, and it extends into the parietal peritoneum. Anatomically, it is a very thin structure that reflects the physiology of the peritoneum.

The majority of patients who visit plastic surgeons present with benign skin tumors, such as epidermal cysts, umbilical hernias, omphalitis with urachal remnant, and hypertrophic scars as a result of port insertion from laparoscopic surgery. We also demonstrated that the majority of our cases were within the common general plastic surgery cases. Moreover, we identified relatively rare cases of rectal cancer with umbilicus metastases, and an infected urachal cyst with umbilical artery remnants.

Umbilical tumors that require surgery include benign tumors, such as epidermal cysts\(^1\), primary skin malignancies, such as basal cell carcinoma\(^2, 3\), metastasis of a visceral malignancy to the umbilicus, known as Sister Mary Joseph’s nodule\(^4, 5\), ectopic endometriosis\(^6, 7\), omphalitis with urachal remnants, and hypertrophic scars caused by trauma and surgery. This study included 32 patients; among them, 11 patients had congenital umbilical hernia, 2 patients had umbilical deformity as a result of open surgery, and the remaining 19 patients had various types of tumor formation that required further diagnoses. Postoperative pathological examination was performed in 11 patients. Based on the medical history, 4 patients were diagnosed with hypertrophic scars as a result of port insertion for laparoscopic surgery; of these, 3 underwent surgery, and the diagnosis of hypertrophic scarring was confirmed by pathology. None of our patients developed an epidermal cyst after laparoscopic surgery, which is characterized by the presence of a bump under the skin. However, based on the mechanism underlying the development of epidermal cyst, it should be considered as one of the possible diagnoses of hypertrophic scarring, as a result of port insertion for laparoscopic surgery\(^1\). Medical history is also important for the diagnosis of ectopic endometriosis as patients often experience pain and bloating during menstrual periods. Although none of the patients in our study had ectopic endometriosis, a study reported that it can be caused by port insertion for laparoscopic surgery\(^9\). Therefore, as with epidermal cysts, ectopic endometriosis should also be considered as a possible diagnosis in patients who have previously undergone laparoscopic surgery.

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Fig. 1. Initial examination.
A dome-shaped mass measuring approximately 2 cm in diameter is identified in the umbilical region.

Fig. 2. Abdominal contrast CT.
a: CT showing a mass in the umbilical region that protruded from the skin and extended into the peritoneum.
b: Computed tomography showing bowel wall thickening from the rectal junction to the rectum as well as enlargement of the uterus. Free air is also observed.
Among various neoplastic diseases, accurate diagnosis is particularly critical for primary and metastatic malignancies, as any delay in the diagnosis may put the patients at risk. The majority of tumors that develop in the umbilicus are benign, and only about 8.3% are reported to be malignant. Among malignant tumors of the umbilicus, approximately 80% are skin metastases from visceral cancers\(^4\). While some studies reported cases of squamous cell carcinoma, basal cell carcinoma, and malignant melanoma\(^2,3\), none of our patients presented with primary skin malignancy. The metastasis of visceral cancers to the umbilicus is named Sister Mary Joseph’s nodule, after the first person who reported this condition. It is considered one of the indicators of a poor prognosis, and occurs in 0.06–0.2% of the population\(^6,10\). The most common primary lesion of Sister Mary Joseph’s nodule is gastric cancer; although it has also been reported in patients with colorectal cancer, ovarian cancer, pancreatic cancer, biliary tract cancer, and uterine cancer. Studies report that 60% of primary lesions can be categorized as poorly differentiated adenocarcinoma, signet-ring cell carcinoma, and mucinous adenocarcinoma. Our patient had rectal cancer with umbilical metastasis, and the pathological diagnosis was moderately differentiated tubular adenocarcinoma. Due to its role in embryology, the umbilicus has a variety of connections with the intraperitoneal space. As such, metastasis can occur from various routes, including blood vessels and lymphatic vessels as well as by peritoneal dissemination\(^5,11\). On CT, our patient did not show any lesions that extended from the peritoneum to the umbilicus. Furthermore, peritoneal dissemination was not observed intraoperatively. Therefore, metastasis in our patient was likely caused by lymphatic or hematogenous spread. The prognosis of visceral malignancy with Sister Mary Joseph’s nodule is poor, and the survival is reported to be less than 1 year if left untreated\(^12\). Treatment options should be selected depending on the type of primary lesion and the presence of carcinomatous peritonitis and distant metastasis. While there are various options, chemotherapy and surgical resection of the primary lesion and metastatic lesion of the umbilicus are typically selected. In our case, the patient presented with gastrointestinal perforation at the time of the initial examination and required emergency surgery. Thus, there was a risk that a delay in the diagnosis could be life-threatening to the patient.

At the time of the initial examination, the abdomen of the patient was flat. The patient did not have any abdominal pain, muscular defense, or rebound tenderness. However, during the
Fig. 5. Abdominal contrast CT.
On CT, there was an area with low absorption with pericapsular contrast from the subcutaneous tissue into the abdominal wall. This area did not extend into the bladder.

a: Transverse plane.
b: Sagittal plane.

Fig. 6. Intraoperative findings.
a: Opening the abscess from the umbilical region.
b: A lower abdominal midline incision is made to observe the area around the abscess.
Arrow 1: Abscess that has been opened.
Arrow 2: Right umbilical artery remnant.
Arrow 3: Left umbilical artery remnant.
c: Immediately after the surgery.
consultation, the patient reported weight loss that occurred within a short period and fever that lasted for over a week. Subsequent blood tests revealed elevated inflammatory response, anemia, and prolonged coagulation time. Since gross examination also suggested metastasis of malignant tumors, we performed emergency CT imaging. Normally, patients with gastrointestinal perforation present with severe abdominal pain and signs of peritoneal irritation, such as muscular defense. As such, the diagnosis can be made based on the symptoms. However, a study suggests that patients may present with few signs of peritoneal irritation if the degree of infection is relatively insignificant and the perforation only results in gas leak. In the present study, we demonstrated that consultation was important in making an accurate diagnosis. Although consultation is considered the basic step, our findings highlighted the importance of comprehensive consultation, rather than focusing on a particular lesion.

Urachal remnants are seen in 50% of fetuses and...
approximately 2% of adults and are sometimes encountered in routine plastic surgery examinations\(^{14}\). In our patient, the cystic lesion of the umbilical lesion was infected and required incision and drainage at the time of the initial examination. Although the infection was well-managed after the procedure, surgical resection was performed as the patient continued to experience pain. Given the location of the lesion and symptoms, we suspected that the patient had omphalitis with urachal remnants before the surgery. As we opened the umbilical region and confirmed the presence of the cyst, we macroscopically identified that the cyst had extended below the skin, and that it connected with a tubular tissue that was suspected to be a urachal remnant. We injected a dye into the cyst to confirm the presence of a fistula and determined that the dye did not flow into the tubular tissue. Although the tissue was not directly connected to the cyst, it adhered to the base of the cyst and split laterally to extend to the caudal portion, becoming a fibrous bundle around the exterior of the bladder. In general, cystic lesions that extend caudally from the umbilicus are considered urachal remnants if they are found between the transverse abdominal muscle and the peritoneum\(^{15}\). Urachal remnants can be classified based on their morphological characteristics. However, since it originates from the urachus, cyst and fibrous tissues exist somewhere between the umbilicus and the dome of the bladder. In other words, urachal remnants are found along the midline of the body. In contrast, umbilical artery remnants are found laterally. While infection of the urachal remnants is common, there are few reports of umbilical cyst infection with umbilical artery remnants. Our search of the literature suggest that there are 2 types of lesions: 1) umbilical artery remnants with umbilical fistula and 2) umbilical artery remnants without fistula\(^{16-18}\). In our case, although there was no fistula formation between the umbilical artery remnants and the cyst that formed beneath the umbilical region, fibrous tissue extended between the structures. As such, we suspected that the patient had umbilical artery remnants without fistula. However, studies on umbilical artery remnants without fistula only suggest that umbilical artery remnants may form cysts and do not provide any evidence on the underlying mechanism of cyst formation. In our study, we performed pathological examinations and demonstrated that the luminal structure of the umbilical artery remnants was retained and that there were red blood cells within the lumen. These findings suggest that the umbilical artery did not form cysts by itself; rather, it is likely that it maintained its structure by forming collateral circulation with a vascular structure around the umbilicus. After birth, the umbilical artery becomes occluded to form a cord-like structure, as it moves into the pelvis with the urachus. Therefore, we believe that the patient had another type of lesion that was different from umbilical artery remnants without fistula. Specifically, we suspected that the presence of urachal cyst below the umbilicus was not related to the presence of umbilical artery remnants. Given the lack of details in the literature, it is also possible that cases of umbilical artery remnants without fistula that have been reported in the literature may have included cases similar to ours.

Umbilical lesions typically require watchful waiting. However, our patient presented with rectal perforation, and there was a risk that a delay in the diagnosis could be life-threatening to the patient. Urachal remnants are common cystic lesions of the umbilical regions that we encounter in our routine practice. In the literature, omphalomesenteric duct remnants, which are remnants of the fallopian tube, are often discussed as a differential diagnosis of urachal remnants. However, our findings suggest that it is also important to consider the possibility of the presence of umbilical artery remnants with umbilical fistula, and urachal cyst with umbilical artery remnants. The umbilicus is a very thin surface structure that is close to the peritoneum and is a scar tissue that results from the connection between umbilical vessels and the urachus. Thus, it can have various morphological features. Clinically, it is important to have adequate knowledge of the umbilicus when treating patients with umbilical lesions.

**Summary**

We performed a retrospective review of patients who visited plastic surgeons with a chief complaint of umbilical lesions. The umbilicus is located in the middle of the abdomen and reflects physiological information of the peritoneum. Thus, patients can present with rare lesions that are not commonly found in the umbilical regions. In addition, a delay in diagnosis can have a significant impact on the prognosis of the patients. Therefore, it is important to note that some patients presenting with umbilical lesions may require immediate medical treatment.

**Consent for publication**

The patients and their family were informed and provided consent for clinical information and the accompanying images to be included in this case report.

**Authors’ contributions**

KK conceived and wrote the article. KK and the others were involved in treating the patient. KK participated in editing the manuscript critically. All authors declare that they contributed to this article and that they have read and approved the final manuscript.

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Conflicts of interest

The authors declare that they have no competing interests.

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