

Catheter Fracture and Cardiac Migration - An Unusual Fracture Site of Totally Implantable Venous Devices: Report of Two Cases

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Totally implantable venous devices (TIVDs) are used increasingly in patients with cancers and other debilitating diseases requiring long-term chemotherapy, total parental nutrition, and fluid replacement. The TIVDs are surgically inserted and fixed in the soft tissues of the chest wall to prevent infection and accidental dislodgment. Acute and chronic complications associated with these catheters include infection, thrombosis, venous perforation, catheter leakage, dislodgment and fall out, subintimal entrapment, and tip migration to neighboring veins after satisfactory initial placement. Catheter fracture and cardiac migration is a rare complication and most reported cases have developed between the clavicle and the first rib as a consequence of a pinch-off sign. We present two patients with metastatic colon cancers with unusual catheter fracture site and migration and discuss the clinical implications. (*Chang Gung Med J* 2005;28:425-30)

Key words: catheter fracture, totally implantable venous devices, pinch-off sign.

Totally implantable venous devices (TIVDs) significantly contribute to the treatment of patients requiring long-term chemotherapy, total parenteral nutrition, fluid replacement, and frequent blood sampling. TIVDs considerably improve the quality of life for these patients by giving them unrestricted ability and freedom in their choice of activities.⁽¹⁾ However, many complications have been reported to be associated with TIVDs.^(2,3)

Catheter fractures and cardiac migration are rare complications, with an estimated rate of 0.1%.⁽⁴⁾ We present two patients catheter fractures with unusual fracture sites.

CASE REPORTS

Case 1

A 40-year-old woman had metastatic sigmoid

colon cancer. She underwent surgical placement of a port-a-cath system (Arrow International, Reading, Penn, USA) via the left cephalic vein using the cut-down technique in January 2000 for the infusion of chemotherapeutic agents. Satisfactory placement of the catheter in the superior vena cava was documented on a postoperative chest radiograph (Fig. 1). She received 12 courses of high dose chemotherapy with 5-fluorouracil and leucovorin weekly during the 3 months following catheter implantation.

In March 2001, about 15 months after the initial implantation, the annual follow-up chest radiograph showed the injection port chamber was at its original position but the catheter had fractured and embolized in the right side of the heart (Fig. 2). The fracture site was just at the junction of the injection port chamber and the catheter.

The patient remained asymptomatic and no

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Fig. 1 Satisfactory placement of the port-a-cath system and the usual site for the pinch-off sign (arrow).

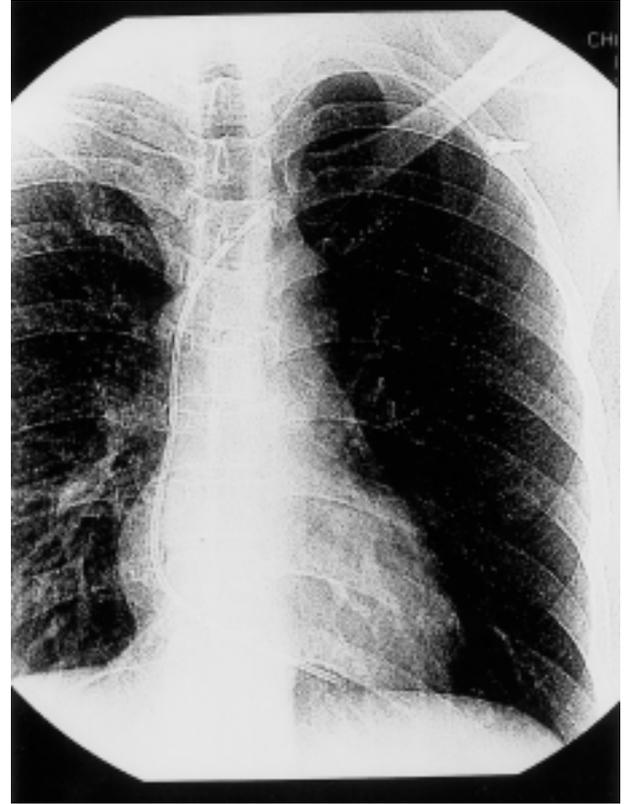


Fig. 2 Chest radiograph showing fractured catheter in the right side of the heart.

chemotherapeutic agents had been administered through the catheter during the previous 12 months.

A plan to retrieve the catheter was made by a radiologist.

A percutaneous procedure was carried out via a right femoral vein puncture. Selective catheterization of the right side of the heart via the inferior vena cava was achieved using the loop-snare technique (Fig. 3). The fractured catheter was engaged and removed through the femoral vein. The injection port system was removed under local anesthesia without any complications (Fig. 4).

Case 2

A 60-year-old man had ascending colon cancer with multiple liver metastasis. A port-a-cath system (Arrow International, Reading, Penn, USA) was implanted via the left cephalic vein using the cut-down technique after palliative right hemicolectomy. A chest radiograph confirmed the correct positioning

of the catheter. The port-a-cath system was used for 31 courses of high dose chemotherapy from July 1999 through January 2001.

In May 2001, he was admitted to the hospital under the impression of bowel obstruction due to carcinomatosis. The port-a-cath system showed withdrawal occlusion and resistance to injection of fluid. A chest radiograph revealed a fractured catheter embolized in the right side of the heart.

The patient had been asymptomatic and no chemotherapeutic agents were infused. After the percutaneous procedure, the fragment was extracted successfully. The patient tolerated the procedure smoothly.

DISCUSSION

Totally implantable venous devices have been used increasingly in cancer patients since the mid-1980s. TIVDs facilitate effective long-term



Fig. 3 Percutaneous retrieval of fractured catheter by a radiologist.



Fig. 4 Injection port chamber with fractured catheter (arrow).

chemotherapy as well as parenteral nutrition, fluid replacement, and frequent blood sampling.⁽⁵⁾ However, TIVDs are not without complications. Early complications include incorrect position, improper anchoring of the reservoir, skin infection,

sepsis, vascular perforation with hemothorax or hemorrhagic pericardial effusion, and pneumothorax. Late complications include drug extravasation, mechanical malfunction, venous thrombosis, or migration of the catheter.⁽⁶⁾ The total rate of complications is about 13%.⁽⁷⁾

Although rarely reported, catheter fractures and cardiac migration are potentially dangerous complications with estimated frequency of 0.1%.⁽⁴⁾ A search of reports in the literature revealed only one prospective study that specifically focused on catheter or catheter fragment embolism, in which 3672 catheter insertions in 3196 patients were followed for 3 years.⁽⁸⁾ There were four occurrences of this complication (1.2 per 1000 patients).

There are two methods for installation the catheter devices: venous cut-down and venipuncture with introducer kit. Catheter fractures have been observed in connection with percutaneous puncture of the subclavian vein. They are invariably located between the clavicle and the first rib. In a comprehensive review of reports in the literature, we found 27 catheter fractures and the reported site of fracture

was at the clavicle and first rib area in 82% of cases.⁽⁹⁾ The other suggestive causes included high pressure infusion for deobstruction or direct catheter injury by guide wires or needles. In 1984, Aitken and Minton⁽¹⁰⁾ first described a so-called pinch-off sign and catheter pinch-off often precedes and may even predict the latter occurrence of a fracture. Catheter pinch-off can be defined as the anatomic, mechanical compression of a catheter as it passes between the clavicle and first rib at the costoclavicular space. When the catheter is surgically placed using a percutaneous puncture medial to the midclavicular line, the catheter travels through the costoclavicular space next to the subclavian vein rather than inside it and it is vulnerable to compression with shoulder movement. To avoid such fractures, insertion of the catheter lateral to the midclavicular line is recommended. This technique ensures that the catheter is then located within the subclavian vein which gives some protection.⁽¹⁰⁾

During a 5-year period, there were approximately 1000 TIVDs implanted in our institution for various purposes. Three episodes of catheter fractures were observed after implantation. One developed the fracture at the typical pinch-off zone.⁽⁵⁾ This report outlines the other two cases of rare complications with an unusual fracture site at the junction of the injection port chamber and the catheter. The patients both were asymptomatic when the fractures were found on chest radiographs. Both fractured catheters were uneventfully removed by a radiologist using the percutaneous procedure.

Surgically, we implanted a port-a-cath system via the left cephalic vein using the open cut-down technique, which practically ruled out the catheter pinch-off. We connected the port system and the catheter gently to prevent catheter trauma. The injection port chamber was anchored to the underlying pectoral muscle fascia with 2-3 prolene sutures and totally implanted in subcutaneous tissue. A test puncture was carried out to check patency and flow through the system before and after the reservoir implantation. Each patient received a chest radiograph immediately after implantation to check the catheter position and identify potential complications such as catheter neck kinking or tip migration to the internal jugular or contralateral subclavian veins. Because of improper anchoring of the fixation site near the deltopectoral groove, the catheter was vul-

nerable to compression between the fixed injection port chamber and the movable catheter with shoulder movements. As a result, catheter pinch-off preceded and the fracture followed.

The most common symptoms associated with catheter fractures include chest wall swelling at the injection port chamber and pain in the shoulder.⁽¹¹⁾ Other suggestive features include withdrawal occlusion, resistance to injection of fluid, sudden onset of cough or chest pain, palpitations, and a swishing sound with catheter irrigation. Many patients are asymptomatic probably because the usual site of fragment migration is the right ventricle and pulmonary artery, and there are few sensory endings in the endocardium and vascular endothelium.⁽¹¹⁾

The management of catheter fractures includes both prevention and early detection measures. Surgical techniques are important in prevention. As suggested by Cassidy et al,⁽¹²⁾ the approach using subclavian vein by puncture should be lateral to the midclavicular line. The routine used during open cut-down technique for implantation has the advantage that iatrogenic pneumothorax and catheter pinch-off are practically ruled out.⁽¹⁾ Moreover, the injection port chamber should be placed far from shoulder joint and never across the deltopectoral groove.

Prevention of fractures may also be accomplished by instructing patients to minimize heavy physical activities that involve the shoulder to make the catheter less vulnerable to compression.

Periodic monitoring is important for early detection. Detection of the fractures is always possible on chest radiographs. Sometimes it can be difficult if the catheter is situated within the heart silhouette.⁽¹¹⁾ In such cases, two-dimensional echocardiography may play a role in locating the catheter.

Once a catheter fracture has occurred, the fragment should be removed as soon as possible. Subsequent embolization to the right side of the heart or pulmonary artery may result in life-threatening dysrhythmias.⁽¹¹⁾ To avoid open surgery, the percutaneous retrieval technique is preferred because it is simple, inexpensive and relatively low risk.

In summary, catheter fractures and cardiac migration are rare complications. The management should be aimed at prevention and early detection. Surgical techniques and instructions to patients are important in prevention. Monitoring with chest radiography aids in early detection. If possible, the frac-

tured catheter should be retrieved as soon as possible.

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全植式靜脈導管斷裂併心內移位 – 罕見之斷裂部位： 二病例報告

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癌症病人使用全植式靜脈導管有日漸增加的趨勢，全植式靜脈導管以外科手術植入血管中，將注射區固定於前胸壁軟組織以避免感染及意外脫落，可提供癌症患者長期化學治療、全靜脈管營養供給或輸液補充之所需。該導管的使用常發生各類急、慢性合併症，包括：感染、栓塞、靜脈破裂、導管位移等等，而導管斷裂併右心內導管移位為一罕見之合併症，且以往報告導管斷裂部位多位於鎖骨與第一肋骨間。我們報告兩例轉移性大腸癌患者，導管斷裂恰發生在注射區與導管相接處，此為罕見之斷裂部位，藉以探討該合併症發生的原因及處理方法。(長庚醫誌 2005;28:425-30)

關鍵字：導管斷裂，全植式靜脈導管，壓扁徵候。

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