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Early Complications of Totally Implantable Venous Access Devices: Prospective Study

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Original Research Article

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Abstract: Implementation of totally implantable venous access devices (TIVADs) is associated with several complications that can be divided into early complications and late complications. The purpose of the present study was to evaluate the different complications related to TIVADs in a single center in Morocco. Our study is based on a prospective analysis, which took place over a period between September 2015 and March 2016 in oncology department of the Avicenne military hospital in Marrakech, in collaboration with thoracic surgery department and vascular surgery department. 36 patients benefited from the placement of TIVADs, with 18 men and 18 women, with a mean age of 55.5 years (from 22 to 71 years). The type of anesthesia was local anesthesia (LA) in 97% of cases with 3% of cases requiring a slight associated sedation. The preferred route was a percutaneous approach. The surgical approach by surgical dissection of the cephalic vein was used only in 2 patients, in 6% of cases after failure of the percutaneous route. The most used vein in our series was the right subclavian vein (RSCV) in 69% of cases, followed by the left internal jugular vein (LIJV) which presents 14% of patients. All patients received a control x-ray after procedure. 50% of the indications were for breast cancers and digestive cancers. Intervention was difficult in 11% of cases. In our series 3 patients who presented complications: 1 case of pneumothorax (3%), 1 case of thrombophlebitis (3%) and 1 case of costo-clavicular clamp syndrome (3%). Elimination of risk factors such as the choice of a technique, the handling of CCI, the use of echo-guidance, aseptic measures can reduce certain complications and their early and adequate management.

Keywords: Cancer, Complications, totally implantable venous access device.

INTRODUCTION

In 2000, the ANAES (National Agency for Accreditation and Health Evaluation) defines an totally implantable venous access device (TIVADs) as a system placed directly under the skin; it is a sterile device allowing access to the skin to the catheter [1]. The reason for placing a TIVADs is the need to use the central venous system for prolonged and repeated use over time.

The introduction of these devices dates from the early 1980s [2]. Today, these devices are widely used around the world. In Morocco few studies have been carried out for the evaluated.

MATERIALS AND METHODS

Our study is based on a prospective analysis, which took place over a period between September 2015 and March 2016 in the department of oncology-internal medicine of the AVICENNE military hospital in Marrakech, in collaboration with the department of thoracic surgery and the vascular surgery department.

All the TIVADs were placed by the same team of three surgeons experienced in venous access with the help of the anesthesiologist. TIAVDs insertion was performed under fluoroscopic guidance in the operating room. A chest X-ray was performed routinely after the procedure to confirm the catheter position and exclude pneumothorax.

Information concerning age of the patients, sex, type of malignant tumor, placement side, insertion vein. The main endpoint chosen is the existence of an early intraoperative or postoperative complication before the first use of the TIVADs and its possible relationship with the presence or absence of a surgical difficulty.

RESULTS

36 patients who received an TIVADs in the surgery department of the Avicenne Military Hospital in Marrakech during the period from September 2015 to March 2016.

18 men or 50% and 18 women or 50%. The average age of our patients was 55.5 years; with extremes ranging from 22 to 71 years old (table-1).

All patients were to receive systemic chemotherapy for neoplasia, mainly breast (28%), gastrointestinal (22%), pulmonary (19%), lymphoma (14%), nasopharyngeal (3%), urological (3%), gynecological other than mammary (3%) and other (8%). In all cases, the implementation of the TIVADs were performed during a planned intervention, in the operating room by a thoracic surgeon, under local anesthesia (AL) (35 cases or 97% of patients), or associated with a mild sedation (3% of patients).

The preferred route was a percutaneous approach. The surgical approach by surgical dissection of the cephalic vein was used only in 2 patients or 6% of cases after failure of the percutaneous route. The most used vein in our series was right subclavian vein (RSCV) in 25 patients, 69% of cases, followed by the left internal jugular vein (LIJV) in 4 patients who presented 14% of patients (table-2). The procedure was simple in 32 patients, or 89% of the cases, then was difficult in 11% of cases.

In our 33 series of patients have simple post-operative follow-up ie 91% of the cases then only 3 patients who have had complications: a patient did a pneumothorax, a patient did a thrombophlebitis of the RSCV and the axillary vein and a patient presented after one month for costoclavicular clamp syndrome (CCS). In our study: 30 patients who have no difficulty in surgery have simple follow-ups and who represent 83% of our series, 3 patients have operational difficulties but the operative follow-up was simple either 8% of cases, 2 patients have no surgical difficulty, but have presented complications (thrombophlebitis of RSCV + axillary vein and a case of CCSor 6% of cases and only 1 patient who has difficulty in taking CVR and introducing the dilator and who subsequently presented a pneumothorax or 3% of cases.

Table-1: Patients characteristics

Characteristics	No. of patients	percentage
Total patients	36	100%
Age:		
median	55,5	
Sex:		
Male	18	50%
Female	18	50%
Cancer location:		
Breast	11	28%
Gastrointestinal	8	22%
Pulmonary	7	19%
Lymphoma	6	14%
Nasopharyngeal	1	3%
Urological	1	3%
Gyneco. other than breast	1	3%
oyher	1	3%

Table-2: TIVAD site implantation

Site	No. of patients	percentage
Vein of implantation:		
Subclavian vein	27	75%
Internal jugular vein	7	19%
Cephalic vein	2	6%
Placement side:		
Right	30	83%
Left	6	17%

DISCUSSION

Cancer patients often require repeated administration of chemotherapy, parenteral nutrition and antibiotics or usually need to provide blood samples. Cytotoxic agents are associated with significant venous toxicity and often lead to venous thrombosis when using peripheral veins [3]. TIVADs have thus greatly facilitated the problem of vascular access and have revolutionized the care and quality of life of cancer patients. To date, TIVADs have become an integral part of daily clinical routine in oncology [2, 4]. However, there are several complications associated with setting up TIVADs or using them (table3). Outside

the immediate postoperative period, a TIVAD must be strictly painless: any painful device is pathological.

Table-3: TIVADs related complications

Early complications		Late complications	
Catheter insertion	Reservoir implantation	Catheter related	Reservoir related
• Pneumothorax • Hemothorax • Arterial puncture • Hematoma	• Wound dehiscence • Hematoma • Seroma • Wound infection	• Catheter occlusion • Catheter misplacement • Thrombosis infection • Pinch-off syndrome • Catheter embolization	• Reservoir rotation • Drug extravasation • Reservoir membrane disruption • Reservoir fracture

Prior to any use, the distal end of the catheter must be routinely checked by a chest X-ray after placement. This snapshot makes it possible to look for immediate, perioperative complications such as haemothorax or pneumothorax. A hematoma, air embolism, vessel sore or CCS syndrome can also occur early. Oncologists are mainly concerned by the occurrence of delayed complications: extravasation, rupture or migration of the catheter and especially, infection and thrombosis [5]. Early complications occur due to damage to adjacent structures during reservoir implantation and catheter insertion, while late complications occur following prolonged catheter placement and disintegration of the reservoir, because of inappropriate use or trauma [6].

The failure to pose is usually due to a failure of puncture, its frequency is variously appreciated, according to the authors and according to the place of puncture. It is generally accepted that, for any trained operator, regardless of the technique used, less than 5% of cases for the subclavian vein [7, 8] and less than 10% of cases for the internal jugular vein [9].

There are two types of hematoma: the local hematoma at the site of the puncture and the pulsatile hematoma by arterial injury: it is more problematic, and remains a complication of the puncture of the internal jugular vein, by injury of the artery internal carotid, or subclavian vein by injury to the adjacent artery.

Pneumothorax (PNO) complicating the placement of subclavian catheters occurs in approximately 5% of cases (decreased incidence depending on the operator's experience) and is exceptional in the placement of the internal jugular catheter [10]. Suspected most often from the puncture by the exit of air in the syringe, the PNO is affirmed secondarily by the clinic and the radiological examination. It is often delayed, appearing only on the systematic cliché "the next day". It seems essential to remember that any failure of puncture (in particular the subclavian vein) prohibits an attempt on the opposite side before a delay of several hours because of the risk of bilateral PNO [7].

Gaseous embolism is a rare complication that is defined as penetration of air through the catheter into the bloodstream. It occurs when using defective external equipment or because of non-compliance with good practices. To avoid this risk, it is imperative to use purged material with each injection, handle in a closed system and prefer the luer-lock syringes [11, 12].

CONCLUSION

Nowadays, the use of implantable chambers in chemotherapy is constantly increasing, making a safe, effective, reproducible, and minimally invasive implantation procedure essential.

However, the occurrence of a complication ranging from a simple hematoma to a serious complication can delay the initial management of cancers.

Therefore the choice and mastery of the technique of laying and the eviction of the various risk factors is essential to avoid any complication, and a correct management of complications remains a kind of tertiary prevention.

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