



Review

The surgery of the long-term central venous accesses in oncology



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ABSTRACT

The implantation of Long-Term Central Venous Catheters (LTCVC) in cancer patients has been essential to conduct the oncological treatments of today. The complexity of the protocols requires accuracy on the management of such devices in order to keep them long-functioning. The article focuses on such subject from an oncological perspective, pointing out threats of the disease to the central venous system (CVS) and the ways to face them successfully. The most salient points related to surgical techniques and the insights to follow-up long-term inserted catheters are discussed. An anatomical classification is suggested to help understand occurrence of malpositions and to north the necessary maneuvers of repositioning. Such matters are based on 3000 LTCVC-placements performed by the author at the Brazilian National Cancer Institute (INCA) between 1999 and 2011. As nearly 30% of the patients presented some sort of anatomical disorder at the moment of the surgery, it was judged worthy to address such experience to those young surgical oncologists willing to tackle LTCVCs in Cancer Units.

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1. Introduction

Young surgeons start their practices performing small procedures such as insertions of Central Venous Catheters (CVC) [1,2].

Nevertheless they must be aware that some difficulties may come up during the surgery if patients present some anatomical and/or clinical adverse-event, which is relatively common in cancer disease. The mediastinum is often struck by tumors that may affect the patency of the Central Venous System (CVS) and influence on the approaching strategy. Additionally, oncological treatments can last months or years, which turns the need of long-term venous indwelling the main goal to be achieved by these catheters. And to

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do so, the oncological knowledge is important to predict evolutive trends of the disease, in a line of reasoning that should preserve venous-sites since the very beginning. Multi catheterizations could be needed along the way, and exhausted venous-sites might turn further surgical procedures more difficult. Sustainable performance of long-term Central Venous Catheters (LTCVCs) is just known on daily coexistence in which many aspects are important to keep them operating for a long period of time. Therefore, it is advisable that surgeons be acquainted with all this process, including the insertion techniques, to raise their chances to succeed in difficult anatomies.

2. Discussion

2.1. Types of LTCVCs

They are available for cancer treatment in two types: the Totally-implantable (TI-LTCVC) and the Semi-implantable (SI-LTCVC), but the option of using one or another is not made at random; it will depend on the proposed chemotherapy-protocol, basically whether it is a solid or hematological tumor [3–5].

The TI-LTCVC is mostly indicated for outpatients under monthly-chemotherapy programs. They are comfortable to bear since the entire system remains idle under the skin between the cycles, which is easy to take care of. It comprises two components apart (the port-device and the silicone-tubing) that can be interconnected during the surgery to enable retrograde-technique of insertion, a procedure whose catheter-tip is positioned previously to the subcutaneous tunnelization [6]. This technique is useful to deal with difficult anatomies, since it uses the guidewire resilience to overcome obstacles and correct malpositions. The drawback of the TI-systems relies on the need to use needles to access the subcutaneous port, which is painful and may injury healthcare-workers accidentally. An overall rate of sharp injuries remains uncertain in the literature, but Trim and Elliott [7] described serious problems of contamination in a mean range incidence of 4% per 10,000 workers annually. In addition, thin needles just enable low-flow stream, which does not meet apheresis, photopheresis or hemodialysis requirements.

On the other hand, the SI-LTCVC is indicated for daily-chemotherapy protocols, usually for hematological malignancies and bone marrow transplants (BMT). As it does not require the use of needles to be operated, it is a painless handling system that fully complies with the Food and Drug Administration (FDA), the National Alliance for the Primary Prevention of Sharps Injuries (NAPPSI), and the Occupation Safety & Health Administration (OSHA) to protect healthcare-workers [8,9]. In addition, it owns a high-flow feature that supports any protocol for cancer treatment [10,11]. On the other hand it is uncomfortable to bear due to the long catheter-line exteriorized through the skin, which restricts the daily basic activities. In addition, its single-component design just enables anterograde-technique of insertion.

Even though it is worth mentioning the peripherally inserted central catheters (PICC) in this context, they will not be a subject matter in this article. The PICC is quite tiny-gauge tubing similar to semi-implantable catheters, a sort of presentation that restrains its use to very specific indications. The insertion technique is different and they never represent an effective solution to overcome difficult anatomies as the article intend to discuss. At the Brazilian National Cancer Institute (INCA) they are mostly indicated for outpatient treatments, usually those protocols under 24 h-regime of chemotherapy or when caustic drugs need to be continuously administered. They are inserted by nurses in outpatient facilities. In case difficulties on getting a right position come up, the patients are forwarded to surgeons to insert an ordinary LTCVC.

2.2. Cancer and thrombocytopenia

The severe thrombocytopenia (platelets <50 K/ μ L) is considered the most significant risk factor associated with bleeding complications in CVC-insertions. Theoretically, when an abnormal International Normalized Ratio (INR) is associated, the threat is supposed to be increased. However, this is not observed in the clinical practice.

A definition for minimal platelet threshold has been attempted in some guidelines, but so far the researchers have not found good clinical trials in the literature to support recommendations of safety on this subject [12]. According to Zeidler et al. [13] most guidelines recommend preprocedural platelet transfusions at a threshold of less than 50 K/ μ L; however, when they reviewed 604 CVC-insertions retrospectively in 193 leukemic patients they came to the conclusion that the surgery could be safely performed without previous transfusion up to 20 K/ μ L platelet counts. Others such as Foster et al., [14] reviewing 259 deep venous punctures in a cohort of 40 liver transplant recipients measuring cases of INR up to 1.5 and platelet counts around 40 K/ μ L, Doerfler et al. [15] reviewing 104 procedures to implant median-bore short-term CVCs in several illnesses, and Haas et al. [16] reviewing 626 insertions of tunneled catheters (8-14.5FR) with platelet counts between 25 and 50 K/ μ L and INR between 1.5 and 2, have not observed changes on the complication rate.

Three thousand consecutive LTCVC-placements were performed at the INCA between 1999 and 2011, in which 1470 were to support BMTs. Among them 690 (71%) were performed under platelets count <40 K/ μ L and 145 (10%) <10 K/ μ L. The preprocedural platelet transfusions were performed in just 18% of the cases, not routinely, and there was no problem other than grade 1 local hematoma promptly controlled by short-time compression.

The cutdown techniques are safer in thrombocytopenic settings, since it is easy for surgeons to control any inconvenient bleeding with ordinary clamping. On the other hand, the landmark punctures (Seldinger technique) [17] are “blind-procedures” with questionable results in misshapen anatomies, even when performed by experienced hands [18]. Today, ultrasound (US) has been considered an useful tool in such matter [19], but it is necessary to get experience in this method, and it has not always been available in many Institutions worldwide. In the literature some questions



Fig. 1. The obese patients are always an anatomical challenge for central venous accesses, mainly women and performed under local anesthesia.

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