TRANSLUMBAR CATHERER PLACEMENT. SIX YEARS' EXPERIENCE AT HOSPITAL UNIVERSITARIO SAN IGNACIO

Implantación de catéteres translumbares: experiencia de seis años en el Hospital Universitario San Ignacio

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Summary

Introduction: In recent years, the Hospital Universitario San Ignacio has become a local and national reference center for translumbar catherer placement. This procedure is one of the last options to achieve effective central venous access in patients without other possible alternatives. *Objectives*: To review the literature, describe the technique and report the experience of six years in the making of this procedure. *Methods*: A search of the available literature about translumbar catherer placement was performed in MEDLINE, OVID, and LILIACS. Additionally, a database of patients with translumbar catherer placement was obtained at Hospital Universitario San Ignacio in the 2008-2013 period. Finally, a retrospective study was performed. Results: 98 procedures were performed in 66 patients (41 men and 25 women). The incidence of complications up to 72 hours post-procedure was observed, identifying only 3 complications (4.6%). *Conclusions*: Translumbar catherer placement is an effective and safe alternative in patients requiring hemodialysis and have exhausted other conventional venous accesses. Our results are according to those reported in the available literature.

Resumen

Introducción: La implantación de catéteres translumbares es un tipo de abordaje venoso que constituye una de las últimas opciones en pacientes sin disponibilidad de accesos venosos centrales convencionales. Objetivos: Revisar la literatura, describir la técnica y comunicar la experiencia de seis años en la realización de este procedimiento. *Métodos*: Se realizó una búsqueda de la literatura disponible sobre la implantación de catéteres translumbares en MedLine, Ovid y Liliacs; asimismo, se obtuvo una base de datos sobre los pacientes en quienes se implantó un catéter translumbar en el Hospital Universitario San Ignacio en el periodo entre 2008 y 2013. Finalmente, se ejecutó un estudio retrospectivo descriptivo. *Resultados*: Se realizaron 98 procedimientos en 66 pacientes (41 hombres y 21 mujeres). Se observó la incidencia de complicaciones hasta 72 horas posprocedimiento y se identificaron solo tres complicaciones (4,6%) *Conclusiones*: El implante de catéteres translumbares constituye una alternativa eficaz y segura en pacientes que necesitan hemodiálisis y han agotado otros accesos venosos convencionales. Los resultados se hallan dentro de los indicadores publicados en la literatura.

Introduction

There is a group of patients who require location of central venous catherers and who have exhausted the availability of traditional accesses (jugular, subclavian, or femoral). Generally speaking, these are people who, due to different indications, have had central venous catherers or other devices placed and who have ended up with a thrombosis or an infection. As a result, stenosis or obstructions of these vascular structures may occur, making it almost impossible to use them as pathways to implant a new central venous catherer.

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This population group is mainly made up of patients which chronic renal disease. Regrettably, in the past few years, this disease and the several pathologies which derive in it have presented an important increase in its prevalence; this situation is reflected in the large quantity of persons in hemodialysis and in the waiting list for a transplant.

These patients require efficient alternatives in order to achieve the adequate central venous access for hemodialysis. These techniques include access through translumbar pathway towards the inferior vena cava, which emerges as a last resort in persons without central accesses who require dialytic urgency.

As a result, it is important to revise and communicate the indications, techniques, and frequencies of the complications of this procedure, as well as supply data which support and help spread their usage.

Theoretical framework

Central venous catherers are frequently required as a temporary or permanent method for several treatments, such as hemodialysis, infusion of medications, chemotherapy or parenteral nutrition. Often, the use of these catherers is prolonged. Inevitably, their usage gradually exhausts the availability of the different access pathways through a thrombosis or an associated infection (1).

Generally speaking, central venous catherers are implanted in the jugular or subclavian veins (2). When the availability of these accesses is exhausted, the femoral pathway can be successfully used. However, catherers in this location are less comfortable and present a greater incidence of complications (3). When the previous access pathways have been exhausted, it is mandatory to find alternatives which enable to perform the pertinent treatment on the patient. Thus, the access through the translumbar, or trans-hepatic pathway emerges towards the inferior vena cava through the azygos vein (4), the small collateral veins (for example, dilated intercostal veins) and the re-channeling of occluded veins.

Within these mentioned "rescue" techniques, the central venous access to the inferior vena cava through translumbar pathway is the following option (1,5). This procedure is technically more complex than the previous ones, as it takes longer and requires greater operating dexterity. However, it is associated to a low incidence of complications (1,6-8).

The indications for the implantation of a translumbar catherer are the same as those of a central catherer, but they have a contraindication for the usage of a conventional venous access such as the thrombosis of the superior vena cava, patients with thrombosis of a venous brachiocephalic trunk (cases in which the usage of the other side as a venous access is contraindicated), or the thrombosis of a subclavian and jugular vein of one same side (9,10).

In terms of the clinical evaluation, it is important to perform an adequate physical examination before performing the procedure, without forgetting the weight and height log of the patient, as well as observe that the puncture area is healthy.

An adequate anamnesis is also important, directed to evaluate any history of coagulopathy or a previous central venous access, and that the devices were implanted (for example, tunneled catherer, reservoirs, catherers of temporal hemodialysis, pacemakers and the filters of the inferior vena cava).

Revising the previous studies of the patients is not less relevant. A scanography of the thorax or the abdomen is important in order to know and understand the venous anatomy of the patient before performing the procedure. Therefore, the operator must consider obtaining an anatomical study before attempting the venous access (9,11,12).

Additionally, the procedure must not be performed while the patient is anti-coagulated or anti-aggregated, unless there is a strong reason to proceed, given that in these cases bleeding can be difficult to control and may be associated to high morbidity and mortality.

Generally speaking, the management of medications is the same as when a similar procedure is going to be performed. Aspirin and clopidogrel are suspended 5 days before and may be continued 1 day after the procedure. Intravenous heparin is suspended 4 hours before and may be restarted after 2 hours if an intravenous bolus is not used, or 4 hours if it is used. Lastly, patients with warfarin may be taken to the procedure when they have an INR lesser than or equal to 1.3, and can be restarted the same day after the procedure if there are no complications (9).

The technique was described for the first time in 1985, by Kenney et al. (12). It is a procedure which can be performed both in adult patients and in children (13).

Materials and methods

A search of available literature was performed regarding the implantation of translumbar catherers in MEDLINE, OVID, and LILACS. A descriptive retrospective study was performed regarding patients who have received an implant of a translumbar catherer in the Hospital Universitario San Ignacio, in the period between 2008 and 2013.

Population. Consisted of remitted, programmed, or hospitalized patients who required the procedure in the Hospital Universitario San Ignacio.

Inclusion criteria. All patients who underwent this procedure for the first time were included in the Hospital Universitario San Ignacio in the described period.

Exclusion criteria. Underage patients and patients who required a replacement or a re-accommodation of a translumbar catherer were ruled out, without considering if it was implanted in the Hospital Universitario San Ignacio, or in an extra-institutional manner.

Collection of patients: The Systems Department of the Hospital Universitario San Ignacio was requested a list of patients who underwent a procedure of implantation of a translumbar or trans-cavus catherer in the mentioned period. A thorough search was performed in the electronic clinical history of patients in the supplied database. The inclusion and exclusion criteria of the study were applied to each one. Subsequently, some data related to the demographic characteristics of the patient were obtained, such as the base disease which required the procedure, the history previous to implantation of the catherer, complications during and after the procedure.

One must take into account that most patients who reach the Hospital Universitario San Ignacio are remitted from a different institution of city. They commonly only remain in observation for a reasonable time period after performing the procedure (generally up to 72 hours); therefore, follow-up in order to observe long-term complications will be the topic of a different work.

In case the catherer has presented some kind of post-procedural complication, it will be logged in the clinical history. The collected data were stored on an Excel spreadsheet.

Following is a description of the technique described in the literature, which does not differ from the technique used in the mentioned hospital (5,11,12,14-18).

The patient is located in a horizontal prone position or with an elevation of 25º of the right side (15,17,18) in respect to the angiography table. The vital signs and the oximetry values are continuously monitored during the controlled sedation or general anesthesia.

The puncture site is located due to palpation and fluoroscopy in the most cephalic point of the right iliac crest; approximately 8-10 cm to the right of the middle line. A small horizontal incision is performed on the skin (figure 1). The puncture is performed with an introductory needle of 18 gauges x 20 cm in length; then, with a fluoroscopic guide, the needle advances in a cephalic and medial manner, with a 45º insertion angle in respect to the horizontal plane, in the direction of the vertebral L3 body, until it touches it (figure 2). Right after, the needle is drawn back and heads in the anterior direction, increasing the angle of incidence until the anterior aspect to the L3 vertebral body, and goes back inhaling until blood return is obtained.

It is important that the puncture is distal to the drainage of the renal veins. Depending on the operator, the usage of a 22 gauge needle could be preferred.

The usage of a scenography guide in order to puncture the inferior vena cava has been informed (18). The position of the needle is verified with the inhalation of blood and by injecting a contrast medium. It is important to rule out the entry to the renal vein with the purpose of avoiding complications such as thrombosis of the renal vein or the dysfunction of the catherer (figures 3, 4).

The entry under the renal veins is preferred. However, entering over them are not contraindicated (11). When the correct position in the inferior vena cava is verified, a guide (in accordance with the utilized needle) is introduced, over which the needle is removed and a vascular introducer is advanced. Subsequently, the guide is interchanged and a straight high-support guide is introduced, which advances towards the right auricle, at the height of T8 (figure 5).

Subsequently, the distance from the site of puncture until the final location of the catherer is measured. In order to do this, a Kelly type clamp will be used, marking the guide when it is found in the place of choice. Following this, the guide is removed with the mark in order to establish when the catherer will be introduced, as well as calculate the length of the tunnel. For this last purpose, a second incision, with a length of 1 cm is made, as distant as appropriate to the external portion of the catherer, which will be tunneled vertically and laterally compared to the first performed incision.

An asymmetrical double lumen catherer is implanted. This catherer is 14 Fr and with a length of 40 cm long, even though catherer of 14 Fr and with a length of 55 cm can also be used in very tall or very obese patients. The risk of migration and dysfunction of the device is reduced by this procedure.

In order to make the tunnel, the point of the catherer is mounted in the tunneler. It is entered through the second incision and advances subcutaneously until it exits through the first incision, therefore forming the tunnel which will include the proximal portion of the catherer.

Subsequently, the trajectory is dilated and the catherer is inserted with a peelable dilator. Only the sheath of the first one is left. Inside of this sheath, in turn, the catherer is introduced with both lights purged and closed. When the catherer is introduced through the peelable sheath, the patient is requested to perform apnea in order to reduce the probability of an aerial embolism (11). The sheath is divided and removed, ideally, by an assistant. The permeability of the catherer is proven by injecting saline serum and by inhaling. At this point, a venography is performed in order to rule out possible leaks or any potential damage which could have occurred during insertion, as well as prove the position of the point of the catherer (14) (figure 6).

Finally, the catherer pathways are washed and heparinized. The first incision is closed to 4-0 suture points and the end of the catherer is fixed to the skin, also with suture, in order to reduce the risk of migration, as well as ensure the position.

This technique has advantages which are inherent to the characteristics of the inferior vena cava, a vessel with a large diameter and high flow, which is rarely completely occluded, therefore enabling the implantation of a long duration catherer. During the procedure, it is important not to injure the ureter, which is a structure which is located lateral and anterior to the utilized approach.

If the protocol of the institution regarding the insertion of central catherers suggests it, prophylactic antibiotics can be administered which cover positive Gram bacteria, such as cefazolin 1 gr IV.

Statistical analysis

For the social demographic variables and quantitative complications, some measures of tendency and central dispersion were calculated.

Results

In the described period, 98 procedures were performed in 66 patients. The total sample of the study consisted of 66 patients, out of which 41 were men and 25 were women. The age range was 25-80 years and the average age was 54.

Figure 1. With a previous selection of the puncture site (located approximately 8-10 cm to the right of the middle line, at the height of the most cephalic point of the iliac crest of the same side), a 1 cm incision is performed, horizontal in respect to the axis of the patient.

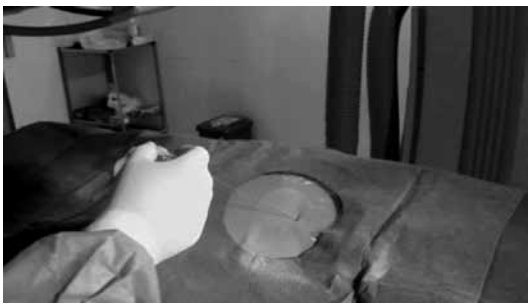

Figure 2. Through the incision site, the needle is advanced in a cephalic and medial direction, with an approximate angle of 45o towards the inferior edge of the L3 vertebral body.

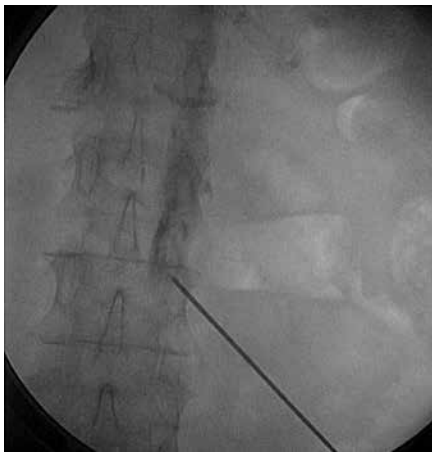

Figure 3. 57 year old patient who was remitted due to an implantation of a translumbar catherer, which in the initial venography, centered on the high lumbar column, demonstrates the access site to the inferior vena cava. Through the administration of the iodized contrast medium, the accidental puncture of a renal vein is ruled out.

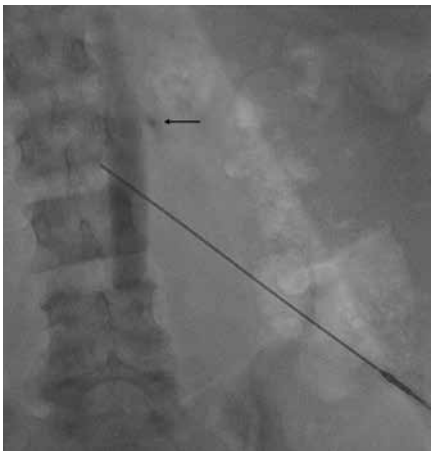

Figure 4. Venography of a 68 year old patient. An opacity of the inferior vena cava is observed. Additionally, the origin of the left renal vein can be identified (black arrow).

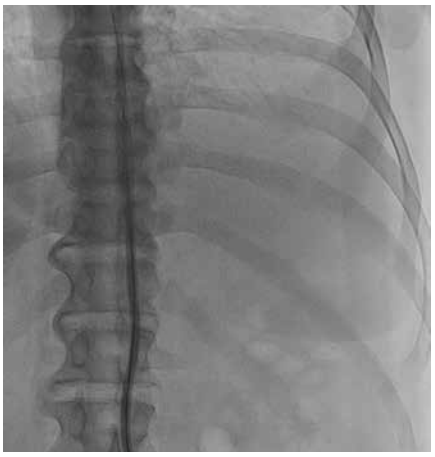

Figure 5. With a previous dilatation of the trajectory from the skin to the inferior vena cava, an insertion of the catherer is performed through a peelable introducer and through a high-support guide. The trajectory of the catherer is observed on the Amplayz high-support guide.

Figure 6. The permeability of the catherer is proven in the final venography. Possible associated complications with the procedure are ruled out, and the location of their distal ends is verified (in this case, at the height of the right auricle).

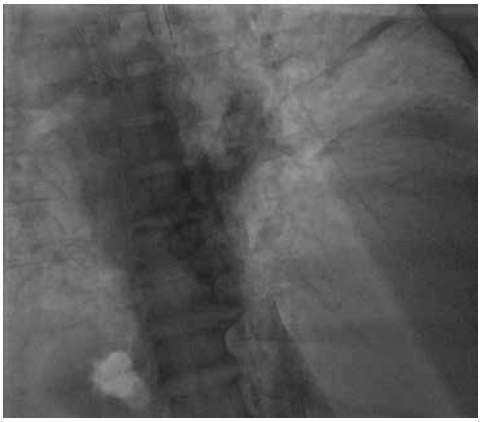

Figure 7. Female 51 year old patient, obese, who had a translumber catherer implant 1 month ago, and who was remitted to emergency service due to a suspicion of a dysfunction of the device. Through the injection of the iodized contrast medium through one of the lumens of the catherer, it is observed that the device is displaced in a caudal direction; additionally some defects in the filling in the lumen of vena cava, adjacent to the catherer, and compatible with thrombi.

The indication of the procedure in all cases was the non-availability of conventional vascular accesses in patients who had a terminal chronic renal disease. Out of the total group of patients, 12 of them came from external nephrology consultation, while the other 54 were remitted were from other health centers in the city or the country. The procedure was performed without complications in 63 patients, which is equivalent to 95.4% of cases. Complications which occurred during the first 72 post-procedure hours were observed. 3 complications were logged (4.6%).

One patient (1.5%) presented a hematoma in the soft tissues of the site of the catherer insertion, which yielded manually in a satisfactory manner, using compressive bandages. Another patient developed several signs of systemic inflammatory response due to bacteremia associated to the catherer, in the first 48 hours, confirmed by a culture. Most probably, this complication could have been related to some failures in the asepsy and antisepsis process.

Lastly, another patient presented migration of the catherer, which required a new implantation. Retrospectively, one can suppose that this situation occurred because the patient was obese; this fact meant a greater distance between the skin and the inferior vena cava, and a traction effect of the catherer by the soft tissues. This patient required a re-implantation of the device in two other opportunities, in which a longer catherer was used (figure 7).

Discussion

Complications associated to the venous central catherers are sepsis, fibrin membranes and thrombosis. Fibrin sheathes tend to manifest themselves as a dysfunction of the catherer, which is proven when blood is not obtained while inhaling. Generally speaking, managing this situation requires changing the catherer, maintaining the original access site, after trying with an infusion of antibiotics up to a period of one hour (9).

Other reported complications are migration or a bad position of the catherer, thrombosis, renal veins or retroperitoneal hematoma. This last one is commonly a self-limiting condition.

The following have been described as causes for migration or the incorrect position of the catherer:

Usage of less rigid and smaller catherers, which deform easily, or performing the procedure in obese patients, in which the device migrates towards the iliac veins, the retro peritoneum and the subcutaneous soft tissues (11). However, there is evidence that proves that a high body mass index significantly affects the frequency of associated complications (19).

Retroperitoneal hematoma is generally a self-limiting condition, given that the retro peritoneum is a limited space. However, it does not represent a large risk unless there is no peritoneal perforation.

In a retrospective study with a sample which included 26 patients, Albert Power et al. (17) revised the insertion of 39 translumbar catherers of the vena cava, with a follow-up period of 15864 catherer days. They found that the incidence of an infection related to the access was 2.84/1000 catherer-days; the incidence in the exit site was 2.02/1000 catherer days. The dysfunction of the catherer caused 0.88 admissions per each 1000 catherer days, which signals that the procedure is relatively safe.

When analyzing the incidence of the dysfunction of the catherer implanted in patients of the *Military Medical Hospital* (20), the incidence was discovered to be lesser (0.21/100 days) than reported in other studies (0.33/100 days). The incidence related to an infection is higher when compared to other reports (0.43/100 *versus* 0.28/100 days); however, their infection rate is higher, possibly due to hospitalization of patients which come from centers with varied epidemiological vigilance.

Brian Funaki makes a comparison of literature in which complication rates are found in the different central access sites: for thrombosis, the rate for 100 catherer-days in the right internal jugular vein is the lowest (0.22), followed by a thrombosis of the inferior vena cava (0.33), the collateral rechanneled vein (0.67), the femoral vein (1.39), and the hepatic vein, with a higher rate of thrombosis per 100 catherer-days (2.40) (3). One may say that the incidence of thrombosis in the cathererism of the inferior vena cave is one of the lowest ones.

According to Funaki (3), the infection rate for 100 catherer-days in the access of the vena cava is not amongst the lowest, but it is still not high when compared to other sites of central venous access. The site with the lowest rate of infection per 100 catherer vein is in a collateral or re-channeled vein (0.06), followed by the right internal jugular vein (0.08); the hepatic vein has a rate of infection of 0.22, the femoral vein has a rate of 0.24 and the inferior vena cava has the highest rate (0.28). However, it is comparable to the femoral vein.

When the catherers were removed, it was not necessary to discontinue the anti-coagulant or anti-aggregate treatment. No significant bleeding was observed.

Conclusions

It is important to highlight that the performance of this technique is not available in Colombia; a proof of this is that the Hospital Universitario San Ignacio has turned into a local and national remission center in order to perform this procedure, which often needs to be performed quickly in patients with dialytic urgency.

If one takes into account that 100% of procedures with this experience were performed on patients with some kind of terminal chronic renal disease, without available venous accesses, and that in the revision of the literature, many of the studies about translumbar catherers consisted in case reports, most of which do not include a sample of patients and procedures as large as the one presented in this hospital; the relatively high demand for the performance of this "rescue" technique is noteworthy. Even if currently it enables to show a wide experience, it may also be the result of the management that this type of patients receive in this country. Currently, the vascular radiologist and interventionist play an important role in the management of patients who require a central venous catherer and who have exhausted other conventional accesses.

In conclusion, the implantation of translumbar catherers is a last resort procedure, constituting an alternative which guarantees a central venous access to the inferior vena cava in an efficient and safe manner.

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