Preoperative Evaluation: History

1

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Introduction

An accurate and thorough preoperative history is a key component of any procedure. The preoperative history allows the interventionalist to appropriately plan the procedure. This includes devising the optimal approach, anticipating potential complications, providing safe and effective conscious sedation, ordering the appropriate supplies, and ultimately performing a successful intervention.

It is very important that the history is taken personally by the physician who will perform the procedure. A pertinent history can be obtained relatively quickly, but the extra effort expended taking a thorough history is time well spent. The interaction with the patient while taking a history allows the physician the opportunity to develop an overall evaluation of the patient and establish a good rapport and often helps to decrease the patient's anxiety before starting the procedure.

Unlike most surgical procedures in which the clinician meets the patient in clinic to evaluate them prior to scheduling a procedure, the interventionalist is often meeting a patient for the first time immediately prior to the procedure. In that short period of time, the interventionalist must determine if the requested procedure is indicated and/or appropriate and whether it can be safely performed on each individual patient. Despite the fact that it is often colleagues and practice partners requesting a procedure, the well-being of the patient is ultimately the responsibility of the person performing the procedure. The history is a key factor in making these determinations and ensuring the patients safety.

This chapter is intended to highlight the aspects of history the interventional nephrologist needs to focus in order to perform a successful and safe procedure. We strived to explain the clinical use of the information obtained through the preprocedure history. Some of the information may overlap for different procedures. Each subchapter has a table that summarizes the pertinent information needed for each procedure.

Conscious Sedation

The patient's comfort is paramount to the success of the intervention. A combination of narcotics (usually fentanyl) and benzodiazepines (usually midazolam) is typically used to induce conscious sedation. There is a fine balance between optimal, too much, and not enough sedation. The presence of comorbid conditions which may complicate the procedure or place the patient at increased risk for conscious sedation must be sought [1].

Is the patient at an increased risk of an adverse reaction to conscious sedation? Has the patient had prior difficulties with anesthesia or conscious sedation? Most dialysis patients have had multiple vascular access interventions and are aware of prior problems. Additional questions that may be helpful include inquiry as to the need for reversal of the sedation, unintended intubation, or paradoxical reactions to medications during prior procedures. Has the patient required an extended stay in recovery or did they have to stay overnight?

Patient allergies or adverse reactions to benzodiazepines or narcotics must be identified. What was the nature of the reaction and how severe was it? Many times the patients are not allergic to the whole class of medications, and related medications can be safely used. Which narcotic or benzodiazepine was tolerated during previous procedures in order to use it again?

Patients with severe abnormalities of the major organ systems such as diseases of the airways, heart, or liver may be at particular risk for adverse events. A detailed history with regard to these organs/systems should be performed so that conscious sedation and the procedure may be adapted for each particular condition. Patients with severe chronic obstructive pulmonary disease tend to be more sensitive to

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Table 1.1 Conscious sedation history

1. Severe abnormalities of major organ systems
2. Presence of hepatic insufficiency
3. Presence of severe COPD, sleep apnea
4. Allergic reactions to benzodiazepines and/or narcotics. Type of allergic reaction. What narcotics or benzodiazepines were tolerated during previous procedures?
5. Panic attacks or claustrophobia during previous procedures
6. Previous adverse experiences with sedation
7. Chronic use of narcotic pain medications or benzodiazepines
8. History of drug abuse

the respiratory depression induced by conscious sedation, so lower doses of both benzodiazepines and narcotics should be used. Likewise, patients with severe sleep apnea need to be identified and over sedation avoided.

Patients with severe congestive heart failure or chronic hypotension may have further lowering of their blood pressure with sedation. Patients with orthopnea from congestive heart failure or volume overload cannot lie flat on the procedure table and often benefit from a wedge placed under their chest. Patients with advanced liver disease may have delayed drug metabolism and thus require lower doses of medications and a prolonged period of observation post-procedure.

At the other extreme, patients may require additional sedation or even general anesthesia. It is important to know if the patient has extreme anxiety, a history of panic attacks, or claustrophobia. It is relatively common for patients to be intolerant of having their face covered during the procedure. Oftentimes premedicating the patient or "tenting" the drape will be enough to make the procedure manageable for them. In other cases, deeper sedation or general anesthesia may be required. Likewise, those with chronic pain may require special accommodations, padding, or deeper sedation.

Patient with ongoing drug abuse or chronic narcotic and/or benzodiazepine use may require higher doses than usual to induce effective analgesia and sedation.

Table 1.1 summarizes the pertinent history needed for conscious sedation.

Medications, Allergies, Preexisting Conditions, and Contraindications

All hemodialysis access procedures target large blood vessels, and therefore bleeding is a potentially serious complication. It is of utmost importance to identify those patients at increased risk of bleeding in order to minimize this risk. Interventionalists should inquire regarding the presence of coagulopathies, thrombocytopenia, history of prolonged bleeding, anticoagulant medication, and anti-platelet therapies. One must be aware of the newer classes of medications such as oral direct thrombin inhibitors which are now commonly used to treat atrial fibrillation. Severe coagulation problems should be corrected before the procedure.

In addition to knowing whether an anticoagulant is being used, the interventionist needs to know the indication for anticoagulation. In some instances anticoagulation can be safely stopped for a few days (for instance, atrial fibrillation), but in others, like prosthetic cardiac valves, the anticoagulation cannot be stopped, and the patient needs bridging anticoagulation.

Careful attention should be paid to the review of the patient's allergies. In the previous section, we discussed inquiring about reactions to narcotics and benzodiazepines. Other clinically important allergies include radiocontrast dye, latex, local anesthetic, and heparin. Patients with radiocontrast dye allergy often respond well to preventive treatment. Depending on the protocol, corticosteroid and antihistamine medications administered beginning the day prior to or the day of the procedure can drastically reduce the risk of reactions. Latex allergy can be extremely severe. Latex-free gloves and instruments need to be used in allergic patients. Patients may have allergies to local anesthetics. Heparin is used in many of our procedures and in locking solutions for hemodialysis catheters. Heparin-induced thrombocytopenia needs to be identified and heparin completely avoided in these patients.

It is imperative to be aware of a patient's preexisting conditions such as chronic hypotension, dementia, neurologic deficits, severe congestive heart failure, and chronic pain in order to differentiate these preexisting conditions from possible new changes that may occur during the procedure or conscious sedation. Likewise, the presence of cardiac prosthetic valves, pacemakers, and inferior vena cava filters needs to be known to exercise caution to prevent dislodging these implants.

Although women with end-stage renal disease (ESRD) have a low likelihood of becoming pregnant, this is not something to be overlooked. All women with childbearing potential should be asked about a possible pregnancy. A pregnancy test should be performed if there is any possibility that the patient could be pregnant. Additionally, elective procedures should be avoided immediately after an acute myocardial infarction.

Table 1.2 summarizes the important aspects of history that need to be taken before any procedure.

Table 1.2 History information important for any procedure

1. Conditions that are increasing the risk of bleeding: coagulopathies, thrombocytopenia, anticoagulant, or antiplatelet medications
2. What is the medical condition that requires anticoagulant therapy?
3. Allergies to narcotics, benzodiazepines, local anesthetic, radiocontrast dye, latex, heparin
4. Recent myocardial infarction
5. Presence of pacemakers, cardiac prosthetic valves, inferior vena cava filters
6. Previous deficits in mentation or inability to ambulate or move extremities. The baseline needs to be known before starting the procedure
7. Pregnancy test

Hemodialysis Catheter Procedures

Tunneled hemodialysis catheter procedures are an important part of the daily activity of any interventional nephrologist and consist of:

- New tunneled hemodialysis catheter placement
- Exchange of a catheter through the same vascular access and tunnel
- Exchange of a catheter through the same vascular access with creation of new tunnel
- Removal of the catheter and placement of another catheter through a different access
- Converting a non-tunneled "temporary" hemodialysis catheter into a tunneled catheter
- Removal of a tunneled catheter
- Obliteration of a fibrous sheath that caused catheter malfunction

Each procedure has a unique indication and addresses specific problems. Before any procedure, we must know the precise indication for the procedure to be able to determine which procedure should be performed.

New HD Catheter In addition to knowing that the patient has committed to HD, we must exclude the presence of an ongoing severe infection which is a contraindication to the procedure. We should inquire about fever, chills, and positive blood cultures.

Most hemodialysis patients have had one or more HD catheters since initiating hemodialysis. The presence of catheters can induce the formation of a stenosis in the veins used for vascular access as well as the superior vena cava. In order to place a new catheter, we need to know: how many catheters has the patient had? What was the location and how long ago were the catheters placed and removed? Were there any previous unsuccessful attempts to place HD catheters because of stenosed central veins? The use of external jugular veins for the catheter placement suggests the lack of a suitable internal jugular vein for access.

The presence of superior vena cava stenosis might impede catheter placement. Asking the patient if they have/had upper chest collateral veins, arm, face, or breast swelling can identify the presence of a central vein stenosis. Identifying these abnormalities can be very helpful and may prompt the interventionalist to consider performing a venous angiogram with possible angioplasty through the venous access site before attempting to place the catheter.

Some patients may have malformations of the central veins such as persistent left-sided superior vena cava. Malformations are rare, but can make catheter placement more challenging. Other patients may have had neck surgeries, neck radiation, or trauma which can also alter the anatomy and the availability of central veins. Each of these possibilities should be considered and inquiry made.

Equally important is the presence of cardiac pacemakers or other intravascular devices such as inferior vena cava filters [2, 3]. The location of current or previously placed pacemakers as well as the timing of their placement should be known. The presence of pacemaker leads can often lead to central vein stenosis at the site of the venous access. The presence of pacemaker wires in the SVC should make us cautious during vein dilatation and catheter placement to avoid dislodging these leads. The presence of an inferior vena cava filter can interfere with a femoral vein tunneled catheter placement or an inferior vena cava catheter placement.

During our discussion with the patient, we need to discuss where the catheter exit site will be. Some patients may ask to change the position of the exit site. In the author's practice, we try to accommodate patient preferences when medically possible.

We need to know the patient's height as this closely correlates with the length of the catheter will use.

Hemodialysis Catheter Removal The reason for catheter removal should be well understood by both the patient and interventionalist. The most common indications for this procedure are catheter infection, catheter malfunction, or that the catheter is no longer needed because of functional arteriovenous access, transition to peritoneal dialysis, or recovery of renal function. It is important to know the precise indication, as to avoid removing a catheter that is still needed.

Hemodialysis Catheter Exchange What is the reason for exchange? Infection? Malfunction? If the reason is infection, is there a tunnel infection that will require the creation of a new tunnel? Is the patient stable enough to have the catheter safely exchanged over a wire? Has the patient's fever resolved? Are there recent blood cultures to assess for an ongoing infection? Has the infection been appropriately treated [4, 5]?

Purulent tunnel exit site discharges, pain, redness, and warmth over the tunnel suggest a tunnel infection. If the tunnel is infected, it is sometime possible to exchange the catheter through the same venous access, but a new tunnel needs to be created.

If the reason for exchange is catheter malfunction, we need to know the nature of the malfunction and if thrombolytic medications have been used to lock the catheter [6]. How successful was the thrombolytic in improving catheter blow flow? If the blood flow did not improve following thrombolytics, it suggests the presence of a fibrous sheath, catheter malposition, migration, or the presence of a kink. Catheters that allow fluid to be infused but from which blood cannot be removed or "pulled" often have a fibrous sheath. In such cases a pullback angiogram is needed to assess for the presence of a fibrous sheath and to obliterate it if present.

Conversion from a Non-tunneled to a Tunneled Catheter This procedure is mainly performed in hospitalized patients. Prior to this procedure, it is paramount to exclude the presence of an ongoing generalized or local infection and confirm that the patient requires ongoing dialysis.

Table 1.3 summarizes the main questions for the hemodialysis catheter procedures.

Angiogram and Angioplasty Procedures

Before starting the procedure, it is important to know the reason the patient was referred for angiogram. The reason can suggest the abnormality that will be found and help in planning the procedure. Prolonged bleeding after hemodialysis needle removal suggests the presence of high pressure in the vascular access and the presence of a tight outflow stenosis. Outflow stenosis is also suggested by increased venous pressures signaled by the hemodialysis machine. Poor blood flow or decreased urea reduction ratio suggests an inflow or outflow stenosis.

The date of access creation and any previous procedures (type and timing) performed must be known. The need for frequent angioplasties (every 2–3 months) suggests a poor prognosis, and referral for surgical revision may be indicated. It is very helpful to know the location of the lesions (stenoses) identified and treated on previous procedures. How severe were the lesions? What size balloons were used for angioplasty and with what results? What pressure was used for angioplasty? Were stents placed, and if so, what size and types of stents were used? What was the indication and location of the stents? If stents were placed, are the stents being stuck for hemodialysis? Were there any complications such as vessel rupture or hematomas after previous procedures? The patient is unlikely to be able to answer many of these questions, but these can usually be found by looking at the medical record or contacting the dialysis unit [7].

If the access is a graft, it is useful to review the operative note to know the diameter and the type of the graft used in order to use the appropriate balloon size for angioplasty.

It is also important to ask the patient if there have been any changes in the access. Pain, erythema, and increased warmth of the access site can suggest infection. Skin ulceration or skin thinning over the access site mainly when it is associated with the presence of a dilated access (aneurysm or pseudoaneurysm) can suggest impending rupture, and this constitutes an emergency that needs to be recognized and treated promptly.

Table 1.4 summarizes the pertinent history prior to angiogram and angioplasty procedures.

Table 1.3 History for hemodialysis catheter procedures

1. What is the indication for the catheter procedure?
2. Infection: fever, chills, positive blood cultures, antibiotic treatment
3. Previous history of hemodialysis (central veins) catheters: number, location, timing, possible problems encountered on catheter placement
4. Infection of the catheter tunnel suggested by purulent discharge from the tunnel, pain, redness, warmth over the catheter tunnel
5. Presence and location of cardiac pacemakers
6. Are there any signs of central vein stenosis, swelling of the face, arm, breast, collateral veins?
7. Presence of inferior vena cava filter

Table 1.4 Important questions for angiogram and angioplasty procedures

When the access was created?
Type and location of the access
Reason for performing angiogram
When the dysfunction occurred?
Presence of steal symptoms
Arm, face, or breast swelling
Pain, warmth, or erythema of the access site
Fevers or chills
History of prior interventions
History of prior complications during vascular procedures
For AVG the diameter of the material used to construct the graft
Ulceration, thinning of the skin overlying the access
Swelling of the access arm caused by infiltration

Thrombectomy

In addition to the history discussed in section "Angiogram and Angioplasty Procedures", there is additional information that must be obtained prior to a thrombectomy procedure. When did the access thrombose? When was the last time the access was successfully used for hemodialysis [8]? How many thrombectomy procedures has the patient had on the current vascular access and what was their timing? A vascular access that has required numerous recent thrombectomies may not benefit from another one.

Prior to starting a thrombectomy procedure, the interventionalist must differentiate the arterial from the venous portion of the graft. Many times the patient is able to tell us by the color of the needles used for HD. The red needle is placed in the arterial side and the blue needle in the venous side. In the author's experience, this is not always reliable. If available, the orientation of the graft can be found from the operative note. Otherwise, the orientation of the graft may be determined based on the position of the wire when advanced into the vessels of the chest.

It is also a good idea to know the hemodialysis catheter placement history in case the thrombectomy procedure is unsuccessful and a tunneled HD catheter needs to be placed.

Table 1.5 summarizes the pertinent history prior to thrombectomy procedure.

Stent Placement

If the use of a stent is contemplated, the pre-procedure history should focus on information that would support their use, such as the number and timing of procedures performed on the current access. Frequent, recurrent, clinically significant stenosis following successful angioplasty supports the use of a stent. AVG thrombotic events should be documented.

Table 1.6 summarizes the pertinent information needed prior to stent placement.

Table 1.5 Thrombectomy

1. Approximate time of thrombosis
2. Last time the access had been used
3. Number and timing of the recent thrombectomy procedures

Table 1.6 Stent placement

1. Timing of angioplasty
2. Location of the lesions
3. Lesions that recur in less than 3 months, especially if located in the central veins or venous anastomosis of the AVG

Fistula Salvage Procedure for Lack of Maturation

Approximately 50% of new AVF fail to mature. Endovascular interventions to assist AVF maturation are effective in increasing the rate of AVF maturation. The timing of the procedure is important. Six weeks post AVF creation seems to be the ideal time to intervene if the AVF fails to mature. The preoperative history should focus on location of the AVF, the timing of placement, and intraoperative or postoperative complications of AVF surgery. Was the access ever used for hemodialysis? If so, what problems were encountered? Were other procedures performed to assist in this AVF maturation? If yes, what was the timing, findings, or interventions [9–11]?

Are there any factors that may prevent an increase in AVF blood flow? We should inquire about severe congestive heart failure (CHF) and severe cardiac valvular abnormalities (stenoses or regurgitation) which may decrease cardiac output. Could the patient have arterial stenoses and central veins stenoses or do they have a pacemaker?

The location and timing of previous failed vascular accesses is important. If the patient still has vascular access sites available, a new AVF might be a better option than repeated attempts to salvage an access that is not maturing despite numerous interventions. If there are no other vascular access sites available, we can consider being more aggressive in hopes that the access will mature.

Table 1.7 summarizes the important data needed prior to fistula salvage procedures.

Peritoneal Dialysis (PD) Catheter Placement

Fluoroscopic or peritoneoscopic-guided peritoneal dialysis catheter placement by interventional nephrologists is gaining popularity. Before the insertion of a new peritoneal dialysis catheter, special attention should be directed toward the con-

Table 1.7 Fistula salvage

1. How long since the access was created?
2. Type and access location?
3. Were there any complications after AVF creation surgery?
4. Use history: Has the fistula been used? Have there been problems with its use?
5. What other procedures were performed to attempt the salvage of the current access and what were the findings and interventions? Timing of the previous salvage attempts
6. CHF, severe cardiac valve abnormalities, arterial stenoses, central veins stenoses
7. The location and timing of the previous failed vascular accesses

Table 1.8 PD catheter procedures

1. Abdominal surgeries
2. Previous PD catheters placed
3. Peritonitis, diverticulitis, ectopic abdominal pregnancies, ascites

dition of the peritoneal cavity. The number, types, and dates of all previous abdominal procedures need to be known [12]. Does the patient have any hernias that may make this procedure contraindicated? A history of abdominal surgeries is not a contraindication to PD tube placement, but it is important to know this prior to the procedure in order to evaluate the chances of a successful and safe procedure as well as the success of peritoneal dialysis as a technique. A history of peritonitis, diverticulitis, ectopic abdominal pregnancies, and severe abdominal trauma should also be elicited.

Any concurrent infection needs to be treated before the catheter insertion. Presence and nature of ascites is important to know before the PD catheter insertion.

Table 1.8 summarizes the pertinent information history prior to PD catheter placement.

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