

## Chapter 8. IA infusion manual for nurses

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# Introduction

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This chapter describes the key points of nurses' work in head and neck IA infusion chemotherapy, in chronological order. The intended readers are nurses who have experience working in an angiography room and can perform general interventional radiology (IVR) procedures, such as TAE of the liver, without difficulty. Therefore, basic skills including radiation protection, handling of anticancer drugs, and aseptic techniques are omitted.

### **Head and Neck IA Infusion**

IA infusion chemotherapy for head and neck cancer is a treatment aimed at cure of the disease. This may come as a surprise to those who have experience caring for patients with advanced cancer, but this treatment has the potential to completely cure even stage IVa and IVb cancers, depending on the conditions.

IA infusion is performed once a week for a maximum of seven times. The cure rate will be comparatively higher if as many sessions as possible are performed up to seven. Nurses play an important role in improving treatment completion rates.

### **Reducing Each Treatment Time**

We often hear that an IA infusion procedure took three hours at one institution whereas it took one and half hours at another institution. By minimizing the time for the treatment through efficient movement of each staff member, the burden on a patient can be reduced and the patient's motivation for treatment can be maintained until the end of the treatment. Preparation of clean fields and pressure bag circuits are areas where the time needed can easily vary.

### **Preventing complications**

The risk of cerebral embolism, one of the most feared complications of head and neck IVR, is largely dependent on management of the pressure bag by a nurse. If a severe complication occurs, the treatment will be interrupted. Keep in mind that the original prognosis of the patients subjected to this treatment was very poor.

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# Before Entering the Room

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## Confirming patient information

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When a physician requests patient information, it can unexpectedly take time to look it up in the electronic medical record. Some data should be kept in mind beforehand.

### **Vitals When Entering the Room**

Since values including pulse rate, blood pressure, and SpO<sub>2</sub> vary from person to person, physicians make judgments based on changes in values from the time the patient enters the room. For example, if a sedated patient has a SpO<sub>2</sub> of 91%, the physician should be informed whether this is due to respiratory depression or whether the patient has obesity and simply has a low SpO<sub>2</sub> when entering the room. The same applies to blood pressure and pulse rate.

### **Hypersensitivity**

The presence or absence of hypersensitivity to contrast agents used in the past will determine which contrast agent will be used this time. Depending on the history of allergies, bronchial asthma, and atopic disease, additional premedication may be administered.

### **Medication History**

Patients with impaired blood coagulation may experience intraoperative blood leakage from the sheath insertion site, subcutaneous hematoma, or a long postoperative compression hemostasis. In such cases, the physician may ask if the patient has been taking anticoagulants or antiplatelet agents.

### **Review the Information from the Previous IA Infusion**

If this is the second or subsequent treatment, it is important to review the information from the previous IA infusion and share it with the physician so that the patient can undergo the treatment with less pain and anxiety. Specifically, the most comfortable position for each patient, the most effective ways and timing of coping with symptoms (e.g., effusion, dry mouth, etc.) caused by IA infusion, and preferred background music. If the previous support was inadequate, prepare and share improvement plans after thoroughly confirming the patient's wishes.

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## Emergency Cart Preparation

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There are a limited number of drugs used in head and neck IA chemotherapy, and once they are confirmed to be ready at the beginning, they do not need to be confirmed every time. Typical drugs used for IA infusion are discussed below. There is no mention of those that would be in regular supply such as epinephrine or atropine sulfate.

For the sake of clarity, we use representative product names as well as generic names (e.g., Buscopan (scopolamine butylbromide), Atarax-P (hydroxyzine hydrochloride)).

### Disinfectant

Povidone-iodine is often used for disinfection of the puncture site, but recently chlorhexidine alcohol has been increasingly used. When chlorhexidine alcohol is used as an antiseptic for the groin in male patients, the groin should be tightly sealed using a combination of [cache-sexe](#) and tape. When alcohol contacts the scrotum, it causes severe pain. Unlike povidone-iodine, sodium thiosulfate hydrate does not remove the color, so when the procedure is over, wipe with warm wet gauze instead of sodium thiosulfate hydrate.

#### Chlorhexidine

Chlorhexidine is a biguanide compound made water-soluble by making it gluconate. It is an antiseptic with minimal irritation to the skin and almost no smell. It not only bactericides at the time of application, but also exerts a persistent antimicrobial effect by remaining on the skin. It is mainly used for skin disinfection in the surgical field and hand disinfection before surgery.

### Local Anesthetics

Used to anesthetize the puncture site. Injectable drugs used at each facility, such as 1% Xylocaine or Marcaine, are sufficient. Anesthetics may also be infused directly into the artery via a catheter to relieve pain and vasospasm during the procedure. In this case, use a product indicated for intravascular administration (intravenous Xylocaine or Xylocaine polyamp are applicable). Vial formulations contain a preservative and cannot be infused intravascularly due to the risk of anaphylactic shock.

### Steroids

Mainly used for anti-inflammatory purposes and for allergic reactions. There is no problem if there is one long-acting type and one short-acting type, such as: Solu-Cortef (hydrocortisone sodium succinate), Solu-medrol (methylprednisolone sodium succinate) or Decadron (dexamethasone). Use the one that is usually available at each hospital.

### Anticoagulant Drug

Heparin is always used, so keep it handy. It is mainly used to prepare heparinized saline solution for trays and for pressure bags, but in some cases, systemic heparinization (intravenous heparin infusion) may be indicated during the procedure. In this case, it is advisable to check whether ACT measurement is necessary after the surgery (i.e., whether a blood coagulometer needs to be prepared). It is also necessary to prepare an antagonist, protamine sulfate, just in case.

### **Sedation**

Sedatives are often used to reduce pain during treatment. The type varies from hospital to hospital and from doctor to doctor, and may be Horizon (diazepam), Atarax-P, or Fentanyl. It is a good idea to ask in advance. If you are using a Horizon, be sure that the antagonist Anexate is available.

### **Antiallergic Agent**

First-generation antihistamines such as Polaramine (*d*-Chlorpheniramine Maleate) and Chlor-trimeton (chlorpheniramine maleate), which are fast-acting antihistamines, are used, but not frequently.

### **Vasodilator**

Nitrates, a type of vasodilator, are infused directly into the artery via a catheter to prevent or release vasospasm. Use what is available at each hospital, such as Nitorol (isosorbide dinitrate) or Millisrol (nitroglycerin). The amount used is only one-fifth to one-tenth of a 5-mL ampule, and most of the solution will be wasted. If the hospital has a cardiology department, smaller, less expensive ampules for coronary injection may be available.

### **Diuretics**

Cisplatin is used as an anticancer agent in IA chemotherapy. Since cisplatin has nephrotoxicity, hydration is crucial to prevent the onset of kidney toxicity. When urine volume is not enough, Lasix (furosemide) is administered. This instruction will often be given from an otolaryngologist, not a radiologist.

### **Antiemetic Drug**

To prevent nausea, one of the most common side effects of cisplatin, patients are already given several antiemetic drugs before they come down to the angiography room. Nausea may still occur during the surgery due to excessive nervousness. In this case, additional Primperan (Metoclopramide) may be administered.

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## Preparation of Tools

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Basic device preparation is the same as for IVR in the abdominal region. The differences are that the catheter and guidewire must be opened in a parent-child set and a pressure bag must be prepared.

### **Angiography Set**

Open the set used at each hospital. Cups for contrast agent, heparinized saline, and drainage, and syringes for local anesthesia (10 mL), contrast agent (10 mL), heparinized saline (20 mL), and cisplatin (20 mL) are sufficient. Syringes with locks are recommended.

### **Sheath Intruder**

A long sheath (effective length 25-30 cm) of 3F, 4F or 5F is used. Confirm the number of French size with a doctor. If there are two types, the standard type and the kink-resistant type (hard to bend in vessels with strong arteriosclerosis), choose the kink-resistant type. The French size of the sheath is the French size of the parent catheter.

### **Parent Catheter**

Parent catheter may be a diagnostic catheter or a guiding catheter (GC). The effective length of the catheter is different from that of the catheter used in the abdomen (70 cm for the abdomen and about 100 cm for the head and neck), which should not be mistaken even though they have the same product name. The shape of the tip must also be confirmed (JB-2 type, multi-purpose type, etc.).

### **Guidewire**

Radifocus guidewire (Terumo) will be used at many hospitals. 0.035" (purple hub) and 0.032" (orange) are used. Open the requested one. Although very rare, you may be instructed to provide an additional 0.038-inch guidewire (gray) when the catheter does not go up.

### **Microcatheter**

Various types of microcatheters are used by each physician at each hospital. The same product name can have different lengths (125 cm to 150 cm), French sizes (1.6 F to 2.3 F), tip shapes (straight, pre-shaped). These are expensive products, so be sure not to get a wrong one. If the tip shape is straight, you should be prepared to bend the catheter using steam or a dryer (hot air gun). Especially in hospitals that use steam, start boiling water in advance to avoid unnecessary waiting time.

### **Micro guidewire**

Micro guidewires are also used in a variety of types by each physician at each hospital. Unlike

microcatheters, there are few confusing products. In addition to the wire itself, accessories (a torque device, introducer, and shaping needle) may be included in separate bags, so be careful not to just take out the wire and throw the box away.

### **Continuous Perfusion System of Heparinized Saline from a Pressure Bag**

Pressure bags are available in 500 mL and 1,000 mL sizes. Either one is sufficient, but if the team is not experienced in IA infusion, it is recommended to use 1,000 mL, as 500 mL may not be enough (and may require a risky intra-operative exchange). Perform a coinfusion of 1,000 units of heparin per 100 mL of saline solution. In other words, 5,000 units of heparin are coinfused in 500 mL of saline, and 10,000 units of heparin in 1,000 mL of saline. Pressurization is not needed yet. The pressure bag is always operated by a nurse and is treated as unsanitary.

The line connecting to the pressure bag from the introduction needle (spike) to the drip chamber is handed to the nurse, and the physician handles the tube and the roller clamp below the drip chamber, which should be initially placed on a clean tray. This tube must be a product that is highly transparent and easily releases air bubbles. A PVC-free infusion set for pumps is recommended, unless otherwise specified by the hospital.

To the tip of tube, three-way stop cock (non-pressure-resistant) and then Y-connector are connected. These are sanitary.

### **Cisplatin Route**

Depending on the facility, the anticancer agent (cisplatin) may be brought in in bottles or refilled into a large bag at the pharmaceutical department. To transfer the cisplatin into the cylinder of the auto-infusion device in the angiography room, a combination of an infusion set, a three-way stop cock (non-pressure-resistant), and a pressure-resistant extension tube are used. These are partially unclean, but should be initially placed in a clean tray. The infusion set may be the one usually used.

In the first session of the IA infusion, two tubes should be ready because a pressure-resistant extension tube is used for contrast imaging as well.

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# When Entering the Room

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## Positioning the patient

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IA chemotherapy takes a little more than one hour in the shortest case, and two and a half to three hours if it takes longer. Since patients often experience back pain during the procedure, it is recommended to place a pressure-relieving pillow under the back and knees to accommodate the patient's physiological curvature (The back pillow can be removed during the process). Once the procedure has begun, the head will be immobilized tightly. Therefore, before the procedure, be sure to complete any necessary procedures as requested by the patient, such as drinking water, suctioning, changing cotton balls if the patient has nasal discharge.

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## Hearing and Explanation

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### **Hearing from the patient**

As described below, in IVR in the head and neck region, the timing for speaking to the patient is limited, so it is necessary to read the patient's complaints from facial expressions and vitals, rather than words.

In the first session of IA infusion, it is necessary to carefully check the patient's concerns, desires, and today's condition (e.g., a rumbling stomach with a call to stool, back pain, etc.) in advance. This ensures that the treatment is started in a more comfortable situation, and when something uncomfortable occurs, the nurse is able to recognize it earlier and respond quickly.

### **Explanation to patients**

Along with the preparation, explain to the patient that he or she will not be able to move the mouth during the examination, that the patient should let the nurse know if having difficulty since the nurse will not be able to talk to him or her frequently, and that a response such as "yes" or a nod is not necessary for explanations or talking to the patient. The X-ray fluoroscopy will begin once a sheath is inserted by the physician, so these instructions should be given before the sheath is placed.

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## Setting of Various Cords

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Cables and routes for an ECG monitor attached to the patient should not enter the irradiation field and interfere with fluoroscopy and should be set up so that they do not bump

into or tangle with each other when CT is taken.

### **Monitor**

The locations for the electrodes of the ECG monitor do not interfere with head and neck IVR. However, note that the cable may get in the way when taking CT images (described below).

### **Manchette**

Blood pressure is measured in the arm that does not have an IV route in it, but in some cases it is taken from both arms. In the middle of a procedure, an IV may not drip properly and be taken from the opposite arm. In that case, the blood pressure is measured in the leg that does not have the sheath in it.

### **Indwelling Bladder Catheter**

Fix the catheter to the thigh opposite to the side for inguinal puncture, allowing for some room. The examination table will be moved frequently, so make sure that the urinary catheter is not pulled too hard. Placing the urine bag on the table is safer, but it is also necessary to monitor urine amount, which is a disadvantage. When securing the catheter with tape on the medial side of the thigh, it should be secured to the leg opposite to the puncture side (to prevent interference with the tourniquet used for applying pressure to stop bleeding after a procedure).

### **Assembling cords not to interfere with the C-arm**

CT images may be taken during the procedure of IA infusion. At this time, the C-arm rotates around the patient's head. As the arm passes under the patient's head, it may catch hanging monitor cables, blood pressure monitor tubes, or IV lines. Such a risk can be eliminated by tying the head ends of the surgical drape under the patient's table and trapping (wrapping) the cables in it.

When the physician rotates the C-arm from the front to the side, observe nearby to see if there is any danger of the cables getting caught on the arm. If there is, tape them to the back of the examination table. Since everyone leaves the examination room during the actual CT scan, it is necessary to secure the cable given that no one is watching it at the patient's side.

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### **Checking the IVRoute**

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In IA chemotherapy, a very high dose of anticancer drug is infused at high speed, which can be dangerous (sometimes lethal) if it were administered intravenously. Despite this, serious complications do not occur because of the continuous flow of the antidote (sodium



thiosulfate) through the IV route and the hydration. Therefore, it is the patient's lifeline whether the drip falls properly or not.

### **IV Route**

If a CV (central venous catheter) is inserted or a CV port is implanted, there is no problem. However, if the route is taken from the peripheral vein, check whether sufficient flow velocity is maintained and the size of the vein from which the catheter is inserted, and keep in mind the possibility of reinsertion.

A typical short hydration rate is 8.3 mL/min. The rate of infusion of the antidote (Detoxol) varies depending on the area to be treated, but the fastest infusion rate is about 15 mL/min. In other words, a stable speed of 23 mL/min must be maintained.

The theoretical flow rate of the 22G IV catheter is 35 mL/min, but this rate drops by half when a normal (thinner) extension tube is connected. Therefore, the choices are to take the peripheral venous route with 20G, to connect a larger extension tube to the 22G, or to take two routes with the 22G. Avoid 24G.

**The antidote (sodium thiosulfate, Detoxol®) causes vascular pain.** It is painful when it starts from a small vein. If there is a choice, try to flow from the larger veins or from the CV side.

### **Positioning of the IV Pole**

Unlike the abdomen, in the head and neck IVR, the distance between the puncture site in the groin and the irradiation field in the head and neck is considerable. This means that the examination table is moved back and forth from the head side to the foot side. If there is a stationary IVR-CT, the patient's table will enter the CT gantry, which means that the patient's table will move a longer distance.

The problem here is the IV pole with the infusion solution and antidote (Detoxol®) hung from it. There is no problem if the IV pole is directly fixed to the examination table, but if the IV pole is a movable type with wheels, the tube may be pulled hard when the examination table is moved, causing the IV pole to fall over or damaging the patient's IV site, if not monitored carefully. Also, be very careful with ECG monitors, as the cables may be pulled as well.

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## **Neurological Examination**

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It is advisable to perform a brief neurological examination upon entering the room (and upon leaving the room) to check for the presence of cerebral embolism. The following should be checked thoroughly: anisocoria, eye deviation, eye movement limitation, pursuit, visual field,

facial superficial sensation, tongue movement, grip strength of both hands, and ankle joint movement.

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## Tasks during IA Infusion

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For a nurse, the flow of the initial stage of the IA infusion is as follows: preparation of minimum tools → physician administers local anesthesia → preparation of other tools → preparation of a pressure bag → physician punctures the patient → observation of the patient afterward. At the same time, cisplatin and contrast agent are suctioned, which might be performed by other staff such as ENT doctors or radiology technicians in some hospitals.

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### Preparing Tools

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#### **Order in which tools are opened**

Keep in mind the flow of the procedure and open the one that is needed first. When there is only one surgeon, as long as the local anesthesia and the sheath introducer are provided first, the time required for the procedure will not be affected by the order in which the other devices are provided.

If there is an assistant physician, the subsequent devices must also be presented in the order in which they are to be assembled. Specifically, the order is: a set of pressure bag system → parent catheter and wire → microcatheter and wire, with a suction kit for the anticancer drug (cisplatin) placed in the desired order.

#### **Open with as Little Help as Possible**

Only the parent catheter needs to be picked up by the physician because the package is long and narrow. Other tools do not require a physician's assistance, and the nurse takes them out on a clean table. When placing instruments on the table, items that may bounce and fall, or expensive ones like microcatheters, should either be placed using sterile forceps or dropped near the patient's feet on the sterile drape.

#### **Do not Overlook Accessories**

In addition to a large bag containing a catheter or micro guidewire, the box may also contain accessories. For example, a box for microcatheter includes hemostatic valves, mandrels for tip formation, contrast syringes and introducers, while one for the microguidewire includes mandrels and torque devices, all of which are necessary for treatment. After removing catheters and wires from the package, check carefully before discarding them to see if any accessories remain in the back of the box.

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## Pressure Bag Preparation

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In endovascular treatment of the head and neck, not only for IA chemotherapy, the pressure bag (or more precisely, the continuous perfusion circuit of heparinized saline) is a very important system to avoid complications of cerebral infarction.

An important part of pressure bag preparation is to ensure that air bubbles are completely removed and never allowed to enter the bag thereafter.

Since the feeding artery (perforating branch) of the cerebrum is approximately  $200\ \mu\text{m} = 0.2\ \text{mm}$  in diameter, for example, even a single small air bubble of less than 1 mm in diameter can, by simple calculation ( $\frac{4}{3}\pi(1\text{mm}/2)^3 \div \pi(0.2\text{mm}/2)^2 =$ ) 16 mm or 1.6 cm long, occlude an artery and lead to a cerebral infarction.

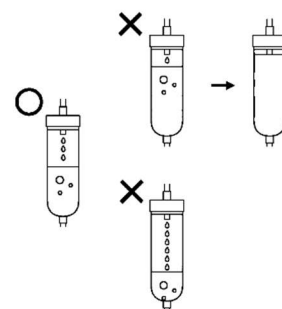
### Preparing a Line

A pressure bag with heparinized saline solution attached is hung from the IV pole. The doctor will give you the induction needle of the line for the pressure bag (infusion set for the pump) from the clean field, and you should take it and insert it into the heparinized saline solution. At this point, the area from the induction needle to the drip tube becomes unclean. The rest of it is clean, since it leads onto the surface of the patient's drape.

Pay attention to the position of the IV pole. If the circuit connecting the groin puncture site to the catheter, lines, and pressure bag is not long enough, the catheter may be pulled when the nurse manipulates the pressure bag during the procedure, or worse, may come out. This is very dangerous. Adjust the position of the IV pole or choose the length of the line to prepare for this situation. Rotating the T-bar from which the pressure bag is hung can also add a few centimeters to the distance.

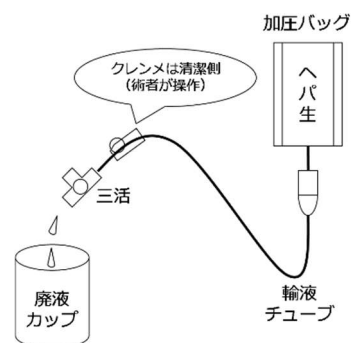
## Adjusting the Drip Tube

Once the physician has closed the clamp, the nurse should adjust the drip tube by applying pressure so that the fluid level is exactly in the middle (one-half of the height). As pressure is increased, the fluid level rises gradually. Therefore, if the fluid level is too high from the beginning, it will reach the ceiling in the process, and the drop will not be visible. Conversely, if the fluid level is too low, air bubbles will be sucked into the line, which is very dangerous. The process of lowering the fluid level once it has been raised too high can be very complicated, so adjust carefully and precisely.



## Removing Air

The doctor opens the clamp. With the heparinized saline solution flowing, the doctor flicks the tube in sequence from the bottom of the drip tube (clean part) to the connector at the end to remove air bubbles.



When the doctor flicks the tube close to the drip tube, the shock is transmitted to the drip tube, causing air bubbles to reappear. Hold the drip tube in the beginning to help remove the air. At this time, the nurse should hold the drip tube at a slight angle, rather than holding it vertically. If the drop is vertical, the impact of the drop on the surface of the fluid will cause bubbles, which may be drawn into the tube. By slanting the drip tube at an angle, the drop hits the wall of it, preventing the surface of the fluid from swaying. Hanging the pressure bag too low slows the flow of heparinized saline solution and prevents the release of air bubbles. Hang the bag slightly higher.

## Fixing the Drip Tube

During treatment, the drip tube may be shaken (e.g., by moving the examination table), which may cause air bubbles to be drawn into the line. It is best to tape the line to the IV pole under the drip tube. At this time, if the fixation position is just below the drip tube, the drip tube will be at an angle, so it is better to fix it with a margin of 10 cm or more. (When removing air, the drip tube was held at an angle, but after pressurization, the drip rate is slow, so it is safe to keep the tube vertical.)

## Pressurization

After the air is removed and the drip tube is secured, the physician will (or may not) give instructions to the nurse to reclose the clamp and pressurize the bag. At this moment, increase the bag pressure to 40 kPa (300 mmHg). Now the pressure bag system is complete.

After pressurization is finished, hook the inflation bulb (rubber ball) to the bottle hook (T-bar) of the IV pole to prevent it from dangling and hitting the drip tube.

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## Observing the Patient

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It is an important role of the nurse to monitor the patient during the surgery, sometimes helping to alleviate pain, and sometimes reporting abnormalities to the physician. However, in head and neck IVR, the nature of the site may limit the interventions that can be performed, which requires caution.

### **Patients cannot Move their Mouths**

In head and neck IVR, the target organs are in close proximity to the oral cavity and pharynx and are strongly affected by these movements. The navigation screen during the procedure is operated on the assumption that the patient does not move, which limits the time when the nurse can talk to the patient.

### **Talking to Patients**

When talking to a patient, be sure to ask the physician if it is safe to talk to him or her at the moment. Of course, avoid asking a routine question such as “Are you okay?” to a patient who is sedated (it would make no sense for sedation).

### **Monitoring without Talking**

As it is not possible to talk to the patient, monitoring the patient relies on facial expressions and vital monitors (especially changes in pulse rate and systolic blood pressure). In fact, pain responses, vagal reflexes, early allergic symptoms, and respiratory depression are often detected via these cues.

### **Dealing with Secretions**

Some patients with maxillary sinus cancer have persistent effusion or blood from the nasal cavity, or suffer from tearing or eye discharge (due to obstruction of the nasolacrimal duct). Observe the patient regularly, and handle it with wet gauze, etc. as needed (while being careful not to move the patient's face).

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## Monitoring the Pressure Bag

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As explained earlier, the important thing in the preparation of the pressure bag is to prevent air bubbles, but the important thing during the operation is to keep a continuous flow of

heparinized saline solution. It is necessary to maintain pressure, but that alone is not enough.

### **Managing Bag Pressure**

Periodically check the pressure gauge of the bag and repressurize it if the value drops. The drip rate of heparinized saline solution is adjusted by the physician by using a clamp, but the drip rate may suddenly increase when the nurse increases the pressure. Therefore, just alert the doctor that you are pressurizing it.

### **Management of Remaining Heparinized Saline Solution**

When monitoring the pressure bag, check the drip tube as well as the pressure gauge to see if heparinized saline solution is dripping (about 0.5 to 1 drop/second). If the heparinized saline solution is not dripping despite sufficient pressure, the heparinized saline solution in the bag may be running low. If there is no remaining amount, it is necessary to release the pressurization, remove the induction needle with the infusion tube clamped, replace the bag of heparinized saline solution, reinsert the induction needle, and re-pressurize after carefully checking that there are no air bubbles in the circuit. This is a complicated process that must be done carefully, otherwise there is a risk of embolism. First, let the physician know that heparinized saline perfusion has stopped, and ask if it is a good time to change the bag.

If there is no dripping in the drip tube despite sufficient pressure and enough heparinized saline remaining in the bag, the physician may have forgotten to open the clamps. Tell the physician that the heparinized saline solution is not dripping.

Exceptionally, when a 3-French parent catheter is used, the drip rate in the drip tube may be so slow (due to the very narrow lumen) that the drip appears to be almost stopped. This is normal.

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### **Checking for Infusion**

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As mentioned earlier, intravenous antidote (Detoxol<sup>®</sup>) infusion and hydration are a lifeline for the patient. If the flow is from the peripheral IV route, there may be a sudden decrease in the flow, depending on factors such as the position of the patient's arms. You should make sure that the infusion has not been stopped. If Detoxol<sup>®</sup> is stopped while cisplatin is being infused, acute renal failure may occur in the worst case.

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### **Heparin Counts**

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Although systemic heparinization is not mandatory for IA chemotherapy, the physician may

order intravenous infusion of heparin depending on the situation. Since additional doses may be administered every hour, record the time of administration and use a timer or stopwatch to keep track of the time, and report to the physician after one hour has passed.

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## Monitoring Urine Volume

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Administration of anticancer drugs (cisplatin) may need to be delayed until a certain amount of urine is produced. Specifically, if the urine volume is less than 250 ml at 30 minutes after the start of IA infusion despite adequate rehydration. If the patient is not urinating, report to the otolaryngologist (in most cases an intravenous infusion of Lasix will be ordered).

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# After the Session

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## Neurological Examination

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The neurological examination described at the time of entering the room will be performed again. If possible, it is advisable to perform the procedure before sheath removal (at the time of signing out) after consulting with the physician. If a cerebral thromboembolism is suspected, the patient can promptly undergo angiography and endovascular treatment.

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## Hemostasis

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### **Need for Heparin Antagonism**

Unlike IVR for the liver, hemostasis generally goes smoothly since patients with thrombocytopenia in the head and neck region are rare.

However, for patients who have undergone systemic heparinization, Confirm before the physician removes the sheath whether the ACT needs to be measured (whether Hemocuron (tribenoside) needs to be prepared) or neutralized (whether protamine sulfate needs to be administered).

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## Resting Time

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The completion of compression hemostasis, the belt compression time after returning to the room, and the time and degree of rest after release of compression should be in accordance with the standards of each facility.