Chapter 1 GENERAL OUTLINE

Surgical operation is the chief procedure of surgical treatment. It is an important component of surgery. We can not give a complete course of surgery without the surgical operation. There are various kinds of surgical operations. The difficulty of operations and the extent and degree of complications are extremely different. But their fundamental techniques are just the same, such as incision, exposure, hemostasis, ligation and suturing. All surgical operations must depend on sterile techniques and anesthesia. Hence, the sterile techniques, anesthesia and fundamental operative manipulations are the three important bases not to be neglected.

I. Aim and purpose

The purpose of the surgical operative experiment are as follows:

1. Setting up sterile idea and preliminarily mastering sterile techniques.

2. Familiarizing with fundamental operative manipulations and preliminarily learning the knowledge of anesthesia and its management in animal.

3. Training strict scientific way of doing things and serious and honest working ethics.

From the most begining to the end of this course, we must deal the sterile techniques as a main point

of the whole teaching process. In the surgical operative experiment one can not carry on the operation without a satisfactory anesthesia; and one can not finish the operation without good hemostasis and reliable sutures. This can be easily noticed by the students. But, if the sterile technique is not strict, it will not disturb the process of the operation. Its serious effects will appear several hours or a few days later. Therefore it is easy to be neglected.

Though this course is called "surgical operative experiment", the main purpose of it is not to demand the students to master some established surgical operative procedures, but to master the fundamental surgical manipulations and sterile techniques. Through stern preoperative and postoperative management it will bring up strict and cautious scientific working style and responsible manner to the experimental animal. If the fundamental manipulations are correct, even though there may be some defects, the experiment will be considered as a successful one. On the contrary, if the manipulations are not correct, even though the operation has been finished very fast, it would be considered as a failure.

Ⅱ. Organization and management

The organization and management of operation is carried out mainly through following regimes:

1. Management and observation of the animals: 10-14 days before the experiment, the dogs are assigned

to all of the experiment groups. Each group has five students. The number of the experiment groups is the same as the label of the dogs and their cabins. After the animals have been assigned, the experiment groups must start to take part in the management and feeding of their own dogs, in order to be familiar with the animal.

2. Postoperative observation and treatment: After operation, the dog must be observed by the group every day and the operator has to write the operative note and the postoperative notes, which should be handed in to their teachers every week.

3. Discussion of mortality or technical mistake: The teachers should also give round to the animal cabins every day. If there is a dog died, it should be dissected together with the group of students, to find out the cause of mortality and whether there is something wrong or not. The dog can be disposed only after the autopsy. The autopsy must be recorded. Discussion among the student group members must be done to find out if there is any defect in operation, e. g. bleeding or leakage of anastomosis, which can be found during autopsy. The teacher has to attend the discussion to help students to get some good experiences and lessons. He can introduce some vivid clinical cases during the discussion for better education.

4. Emergency rescue: If some postoperative

complications e. g. bleeding, wound disruption or evisceration, have been found, the students must report to the teacher immediately in order to rescue the animal in time. It is available to train the students the spirit of earnest and responsibility.

Ⅱ. The task of the team

1. Operator: He is the chief staff of the team. His duty is to make the incision, hemostasis, ligation, exposure and suturing. He is the commander of the team during the operation, but he has to consider every good advice from the team in order to procced the operation by common efforts.

2. First assistant: He should go to the operating room earlier. He has to scrub his arms first and complete the sterilization and draping of the animal to be operated. He should stand on the opposite side of the operator during the operation and is the chief cooperator. He helps the operator to check the bleeding points, draw the suture needles, expose the operative field and make every procedure be carried out smoothly. During the operation, he has to do his part just in time actively. After the operation he should help the scrub nurse to wash the instruments, put the towels in order, dry the instruments with cloth and finally oil them.

3. Second assistant: His duty is to fix the animal. He occupies the position on the left side of the operator. He has to expose the operative field with

retractors, clean off the blood with gauze or sucker to make the field clear and cut the ligatures. After the operation, he should help the scrub nurse to wash and wipe the instruments, and finally clean the operating room.

4. Scrub nurse (or instrument nurse): He is the first one among the team to do the scrubbing. After draping the instrument table, he must stand on the right side of the operator. His duty is to supply instruments for the operation. The number of instruments and gauze should be counted accurately before and after the operation. The instruments should be passed to the operators in time and exactly.

5. Anesthesist as well as running nurse: He is the one who should get the dog from the animal cabin to the operating room. He should do the anesthesia, shave the skin of the operating field, fix it on the table, manage the anesthesia, observe the animal and do the emergency treatment if necessary. He should unwrap the outer layer of the instrument package. He should assist the operating team to put on their operating gowns, and supply materials when needed. (Fig. 1)

Ⅳ. Anesthesia

1. The food basins for the animals to be operated should be cleaned the night before operation. No more food should be allowed except water. This should be check by the anesthesist.

2. Pre-anesthesic drugs: Atropine 0.008-0.01 mg /kg intramuscularly.

3. Anesthesia:

(1) Sodium pentobarbital in 2.5% solution, 25mg/kg (1ml/kg) intraperitoneal or intravenous injection. Intravenous injection should be given slowly.

Attention: 1) This drug would inhibit the respiration remarkably. Therefore the respiration should be watched closely. If the rate of respiration decreased to below 10/min., artificial respiration should be started. The respiration would return to normal in most of the cases. The artificial respiration should be continued until the respiration returns normal.

2) The drug should not be injected into bowel lumen during intraperitonael injection, otherwise the anesthesia will be failed. If there is ascites, the anesthesia will also be poor.

3) If the anesthesia is poor, additional drugs should be administered very carefully. Addition of same kind of anesthesic drug would easily cause mortality. Therefore, additional anesthesia with other drugs, such as ketamine 6-8 mg/kg im or iv, is advised.

(2) Ethyl ether: The dog can be anesthetized with open drop or flask ether through intratracheal tube. This is a quite safe method as a whole.

The chief sign to be observed is respiration. If the respiration is deep and smooth, with eyeball fixed, muscle relaxed, the anesthesia is up to 3rd

degree 2nd grade. The respiration should be observed continuously during the course of anesthesia. Once there appears signs of respiratory inhibition, the administration of the drug should immediately be stopped. Most of the animal would recover after stoppage.

V. Operative note and postoperative notes.

The operator should write down the operative note right on the day of operation, and he should take postoperative notes every day after the operation, until the wound has healed and stitches were removed. The operative note should include the method of anesthesia, position of the dog, the type of draping, place of incision, procedures of operation in detail and the findings during operation (this should particularly be emphasized), e. g. whether the intestine was normal or not, the way of excision and suturing, the kinds of suture and drainage, was there any accident or not, how to manage the accident, the quantity of blood loss, the effect of anesthesia, how did the animal stand the procedure and did blood transfusion be given or not. The postoperative notes include mainly the vital signs(heart rate, respiration) of the animal, its activity, appetite, the condition of incision, etc.

All the notes should be written in order, with careful handwriting. The description should be simple but clear cut, using technical terms, and the notes should be made every day.

Chapter 2 ASEPSIS

Asepsis is the measures for tbe prevention of infection during operation, puncture, injection, catheterization and dressing. It includes sterilization, disinfection and strict aseptic manipulation and regulations.

Asepsis is the foundation of surgical operation and also is the basic condition of a successful operation. Hence, every one must have strict aseptic concept and follow the aseptic principles with meticulous care. It is not only a matter of fundamental technique, but also a serious problem of medical ethics.

I. Sterilization

Sterilization mainly means the use of physical methods to kill the microorganisms adhered to all the instruments and drapes used to get in contact with the wounds, in order to prevent infection. The two most common methods are steam autoclave and boiling sterilization.

1. Steam autoclave sterilization: It is accomplished in an autoclave. It is safe and reliable. It is used for sterilizing those articles that can tolorate high temperature, such as metal, glass, rubber, liquid, dressings and so on. Within the autoclave, the temperature can be elevated with increasing pressure. Usually if the steam pressure is 1.05-1.40 kg/cm^2 (15

-20lb/in²), the temperature can reach 121-126℃. Any kind of microorganisms including bacterial spores can be killed under such condition for 30 min. (Table 2-1).

2. Boiling sterilization: It is the simplest and most commonly used method of sterilization. It can be accomplished with a boiling sterilizer or an ordinary aluminum pot. It is used for sterilizing metal, glass, rubber, silk, etc. The bacteria will be killed if the whole instrument is immersed in boiling water of 100℃ for 20 minutes. But bacterial spores will be killed until over one hour. If the sterilization is carried out in boiling 2% sodium bicarbonate, the boiling point will be raised to 105℃, and the period of sterilization can be shortened to 10 minutes. It can further prevent metal instruments from rust.

Table 2-1 TIME AND PRESSURE FOR AUTOCLAVING DIFFERENT ARTICLES

Item	Steam pressure	Time (min)	Temperature (℃)
Rubber, solution	1.05kg/cm² (15 lb/in²)	15-20	121°
Metal & glass instruments	1.05kg/cm² (15 lb/in²)	20-30	121°
Dressings, cloth	1.4kg/cm² (20 lb/in²)	30-45	126°

Ⅱ. Disinfection

Disinfection or antisepsis means the use of chemicals to kill or suppress the multiplication of microorganisms. The most common method is the immersion of sterile solution. It is mainly used for sharp instruments and different kinds of endoscopes, which are not suitable to heat sterilization. The operator's hands and arms, as well as the skin of the operative field are also sterilized with this method. The common antiseptic solutions are as follows. (Table 2)

Table 2-2 USAGE OF COMMON ANTISEPTIC SOLUTIONS

Solution	Time of immersion	Usage	Remarks
1:1000 Bromogeramine	30′	(1) Instrument sterilization	Change the solution once every week.
70% Alcohol	30′	(2) Operator's hands and arms	Filter and check the concentration daily.
3% Tincture iodine	Until dry	(3) Skin of operative fieled	

Ⅱ. Aseptic preparation for operator and animal's skin of the operative area

A. Preparation for operator

1. General preparation. Put on clean clothes, shoes or slippers, cap and mask (for strict aseptic operation, the clothing and mask should be sterile).

All the hair, nose and mouth should be well covered. The finger nails should be shortened before scrubbing. One should not attend the operation with his hands or arms injured or infected.

2. Scrubbing and sterilization of upper extremities:

(1) Preliminary washing of the hands, forearms, elbows and lower half of upper arms with soap and water for three times in 3–5 minutes.

(2) Use aseptic brush and sterile liquid soap to vigorously scrub the finger nails and four surfaces of each finger. At least 20 strokes should be given to each surface for the nails, the fingers, the palm and the back of hand, 10 strokes for the forearm, the elbow and finally the lower part of upper arm about 10cm above the elbow. It should be done alternately with one hand following another, then by turns the forearm and finally the upper arms. The scrubbing should be done in sequence from fingers upward. It is not allowed to scrub back from the arm to the hand. No place can be missed. The number of strokes and the vigor of scrubbing is far more important than the time spent. Special attention should be made to the nail fold, the web between fingers, the ulnar side of forearm and the ventral side of elbow.

(3) After every turn of scrubbing, rinse with water from fingers down to the elbow. Always keep the hands higher than the elbows. Don't allow the

water flow back from elbow to the hand. Repeat scrubbing and rinsing for three times in about 10 minutes.

(4) Take two pieces of sterile gauze or towel. Use one of them to dry one hand by blotting. Then, dry one arm from wrist upward to the upper arm with short strokes. Dry the other limb with the other piece of gauze in a same way. Beware of not touching the arm with the hand.

(5) Immerse the two upper limbs in a tub filled with 70% alcohol or 1:1000-2000 bromogeramine up to the level of elbow or a little bit higher for 5 minutes. During immersion rubbing of hands and forearms will greatly increase the germicidal effect. Withdraw the limbs out of the tub and crook it to keep hands up and forwards to let the solution drip back to the tub from the elbow.

(6) Care must be taken to avoid contamination of the scrubbed hands. No nonsterile things should be touched. The hands should always be kept forward and a little bit raised. Don't drop the hands below the level of the belt, behind the anterior axillary line and move above the level of shoulder. The scrubbing should be repeated right from the begining in case of contamination.

3. Gowning and gloving:

(1) Gowning: Grasp the folded gown by its collar away from the instrument table and unfold it to its full length, with its inside facing the operator.

Make sure that there is ample room for putting on the gown without touching surrounding objects. Shake the gown to free the sleeves and remaining folds. Toss the gown into the air and catch it by thrusting both hands into each arm holes. Keep the gown suspended on the outstretched arms, until the assistant has pulled the posterior rims of the gown to help putting on the gown in place with the operator's hands passed out of the cuffs. Pass the tapes of the gown backward with crossing arms to let the assist tie the tapes. (Fig. 2-1)

(2) Gloving: Select the proper glove size to fit the operator's hands neatly but not tightly. Before donning the gloves, the hands should be powdered with talcum powder for lubrication, which facilitates the insertion of the hand into the glove (In our laboratory, gloves are powdered with talcum before steritization, so it is not neccessary to lubricat again before use). As the gloves are picked up, it is well to remember that only the inside of the glove should be touched. The left glove is picked up by the right hand. It is held on the palm side of the everted cuff. The left hand is inserted into the glove while steady traction is applied by the right hand (avoid over traction). The fingers should be spread slightly and worked into the glove. As soon as the fingers of the left hand are in place, the glove is released, leaving the cuff still everted. Then the right glove is picked

up by placing the fingers of the gloved left hand within the fold of the everted cuff, which is actually the outside of the glove. The glove should be engaged on the palm surface, and the fingers of the left hand (except the thumb) should be flexed to tract the glove at the inside of the fold everted. Insert the fingers of the right hand into the glove and the glove is completely donned. Make sure that the everted cuffs cover the gown cuffs completely. (Fig.2-2)

B. Preparation of the skin of the operative area.

1. Clipping and shaving of skin: The area of clipping should be large enough so that there will be no interference or contamination from hair during the surgery. It had better cut the long hair with scissors before clipping and shaving.

2. Skin sterilization: Before sterilization, the shaved skin should better be scrubbed with a small pledget of cotton soaked in ether to remove the oily secretions from the skin. The sterilization is done by the first assistant before gowning. A pledget of gauze soaked in 3% tincture iodine is applied, using a sponge forceps, with a rubbing motion. The first stroke is applied over the proposed line of incision. The following strokes are applied progressively farther from and partly overlapping the first one until the edge of the clean area is reached. Always work from the cleanest area outward to the dirtiest and never cover the same area twice with the same pledget. After the

tincture iodine has been dry, 70% ethyl alcohol is used to de-iodize and further sterilize the area. For abdominal operation of dog, the skin antisepsis should extend cephalicly to 10 cm above xiphoid, and caudally reaching pubis.

3. Draping: After antisepsis, cross drapes are applied. The first towel is applied across the caudal part, with one edge folded toward the proposed incision site. The second towel is draped across the cephalic end of the animal, with the folded edge toward the operative area. Thus limits the length of the incision. The third towel is applied on the opposite side of the incision site. The fourth one can be placed on the operator's side. Fasten the towels with towel clamps at the four points of intersection of the cross drapes. Lastly a large abdominal sheet is draped with the hole falling on the proposed incision site. If the draping is done with gloved hands, after draping, take off the gloves followed by gowning and changing another pair of gloves.

Ⅳ. Aseptic principles in operation

Every one who attends the surgical operation should always beware of the possibility of contamination. Violation of the aseptic regulation would not show its bad effect immediately, but it will develop a very serious disastrous result. It may lead to infection of incision, failure of operation, or may even threaten patient's life. Therefore, all the members, who

participate in the operation, have to follow the aseptic principle strictly and consciously. They should correct each other for any action which breaks the aseptic principle promptly without hesitation.

The rules of aseptic technique are as follows:

1. As soon as the scrubbing begins, the upper limbs are not allowed to touch any nonsterile object. After gowning and gloving, the hands and arms are only allowed to move within the range of both shoulders above, the level of operating table below and anterior axillary line on both sides.

2. Instruments should be passed at a lower level above the operating table under operators' arms. It is not allowed to pass anything behind the operator. Any instrument which drops below the level of the operating table should not be used any more.

3. The operators' heads should not bend too low near the operative field, or touch each other to avoid debris dropping into the incision. In case of need the operators on the same side should exchange their position back to back.

4. Once the glove has been lacerated or contaminated, it should immediately be changed. If the sleeve of the operating gown is contaminated, an isolated sleeve can be used to cover it. If the gown should be changed, the original gown should first be taken off and then the gloves. The moisened drapes should be covered with another dry towel at once.

5. 70% alcohol should be used once again to sterilize the skin before making incision or suturing of the skin. Gauze or pad should be placed to isolate other surrounding organs before opening a hollow organ to prevent contamination.

V. Regulations of operating room administration

Strict administration of the operating room is one of the important constituent of aseptic technique.

1. The sequence of operations should be arranged according to the degree of possible contamination. Strict aseptic operation should be arranged first in the aseptic room. Possibly contaminated and definitely contaminated operations should be arrananged afterwards in order, or in other rooms.

2. After finishing an operation, the floor of the operating room should be cleaned, with dirty water and other dirts discarded. The drapes and cotton materials used should be removed to a container for laundry and resterilization. The operating room should be cleaned with every thing put in order at the end of every working day, and be thoroughly cleaned once every week.

3. The air in the operating room should be sterilized by ultraviolet ray every evening and by antiseptic agents weekly. 12ml of 80% lactic acid can be used for every 100 cm^3 by vaporizing the acid through heating. The door and windows should be closed during vaporization and opened for ventilation for 30