H29海外臨床実習

番号	氏名	渡航先	国・地域	渡航先での受入期間
1	F. K	グローニンゲン大学	オランダ	H30/2/1-H30/2/28

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医学部医学科 5 年

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This February, I got a great chance to study in Groningen University, Netherland, in the department of Anesthesiology. I really had great experience there and would like to write report of my experience. I would like to divide in to four parts. First, I will write down my brief schedule of my stay. Second, is monitoring and examination, which I learned about anesthesiology. Third part is about the difference of medical system and education, and Final part is conclusion of my stay.

Schedule

30/01 Flight to Amsterdam

31/01 Move to Groningen

01/02 Brief introduction of the UMCG

02/02 Brain Surgery – Glioma

03/02 Trip to Bremen

04/02 Trip to Bremen

05/02 GI Surgery – Laparoscopic gastrectomy, Laparoscopic examination

06/02 Brain Surgery - Meningioma

07/02 Plastic surgery – Implanting tissue expander after breast cancer

08/02 Trauma Surgery – Femoral neck fracture

09/02 GI Surgery -

10/02 Trip to Rotterdam

11/02 Trip to Rotterdam

12/02 GI Surgery - PD

13/02 Brain Surgery - Glioma

14/02 Orthopedics – Spinal Hernia

15/02 Brain Surgery - Meningioma

16/02 Brain Surgery and Orthopedics – Spine Hernia

17/02 Trip to Den Haag

18/02 Trip to Den Haag

19/02 GI Surgery – Palliative Gastroduodenal Anastomosis

20/02 Brain Surgery – Medulloblastoma

21/02 Trauma Surgery – Femoral neck fracture

22/02 Orthopedics – Femoral Diaphyseal Fractures

23/02 GI Surgery – Pediatric Liver Transplant

24/02 Trip to Amsterdam

25/02 Sightseeing around Groningen

26/02 GI Surgery – Roux-en-Y

27/02 Orthopedics – Femoral Head Prosthesis

28/02 Farewell

01/03 Stay in Amsterdam

02/03 Flight back to Japan

Monitoring and examinations

ECG

Intra-operative Arrhythmia, Angina, MI and Electrolyte disorders can be the possible dysfunction that are necessary to be measure through ECG. Arrhythmia can happen possibly because of cutting too much tissues since it will release more sodium to the blood. Electrolytes disorder can be derived from kidney or pulmonary dysfunction. DVT (Deep Vein Thrombosis) or other coagulant disorders can be the possible cause of MI. However, we should also note that it is subject to change easily by the other reasons, such as movement of their body or somebody touching the patients' body.

Arterial blood examination

Roughly speaking, normal PH is around 7.35-7.45, pCO2 4.7-6.0 and pO2 12. From these measurements, we can see the rough oxygenation level of the patients, though it does not reflect the real-time status of the patients since it needs some time to the procedure (take out the blood, examine). Human blood have buffer effect, and PH 7.35-7.45 is the ideal PH for our body to function, especially the enzymes, and it is mainly controlled by the kidney and the lung. Those figures will also reflect the patients' background or underlying disease. For example, if a patient have pCO2 of 6.1 but has PH of around 7.44 (which is almost alkalosis), we should consider something abnormal is happening inside the patient. In such case, it is reasonable to think that the patient have COPD (Chronic Obstructive Pulmonary Disease), and the patients get use to the high

Lactate is also measured to see the patients' oxygenation level, and if the lactate is higher, we should consider anaerobic respiration of the patients. It is especially produced when the cells suffer from hypo-oxygenation, so the possible reasons are pulmonary dysfunction or cardiac dysfunction. Therefore we should check the expiration CO2 monitor, Flow-Volume curve, SpO2, connection of the mechanical ventilation, and obstruction of their airway in order to know the reason of the anaerobic respiration of the patients.

BP

Because of the effect of anesthesia, BP will be lower than usual during the surgery. However, BP is important to maintain the blood flow of the brain, so to keep the BP high enough is extremely important for the sufficient cerebral blood perfusion. In the field of anesthesia, nor-adrenaline, which mainly act as alpha-1 agonist and affect the blood vessels to shrink, is often used to increase the blood pressure. Practically, the range of the medication used in anesthesia is not so broad.

Theoretically, judging from the medication we usually use for chronic hypertension (beta-blocker, ACE/ARB, diuretic, Ca blocker), it is reasonable to use beta-agonist or Ca formulation to raise the BP of the patients. Indeed, anesthesiologist sometimes use beta-agonist for the patients who suffer from chronic heart dysfunction to ensure enough blood flow from the patients' heart. On the other hand, however, we should note that not to use too many kinds of medications, since it is prone to have higher human error, and anesthesiologists tend to leave OR during the operation and anesthetic nurse will take over them.

Also, we have to understand the pharmaceutical mechanism of the medication. The effect of Nor-adrenaline is mostly alpha-1 agonist, but it also have a little bit of beta agonist effect, so even if the BP decreases, heart rate will not be as low as we expect for pure alpha-1 agonist, and BP will probably be stable. On the other hand, for example, phenylephrine has only alpha-1 agonist effect,

so HR will increase to compensate for the increase of the cardiac output induced by the high BP. Therefore, it is important for us to know the pharmacology of the medications and to judge what is happening on the patient's body based on them.

Albumin is also useful to maintain the BP, and it attracts the water from the tissue to the vessel. I got a chance to see a pediatric liver transplant, and the doctor said it is important to add albumin, because they can easy lose water and albumin from their body because of vaporing especially in open abdomen surgery.

Adding the fluid is also one of the ways to increase the BP of the patients. We should judge the adequate amount of fluid by the patients' body functioning status (such as kidney, pulmonary and cardiac function), urine volume and BP. Except for the emergency case, adding too much fluid might provoke lung congestion or ascites in the patients' body.

BP is also subject to change due to the awareness of the patients. Analgesia or sedative we use can suppress the BP of the patients, by affecting the cerebral level. For example, propofol suppresses the brain function by increasing the amount of GABA, which is an inhibitory neuro transmitter and leads to the suppression of the BP. On the other hand, BP can be increase due to the patients' awareness. If the patients feel the pain during the surgery, sympathetic nerve will be active and it can raise the BP.

Therefore, it is important for us to monitor BP to ensure enough blood flow to the patients' brain and to know the deepness of the anesthesia. The ideal BP during the surgery depends on the patients' background, and according to that and the type of the surgery, we should determine the moderate BP for the patients.

Body Temperature

When the BT is too high, possible reason is too much warming by the machine or malignant hyperthermia. Though hyperthermia is sometimes lethal to patients, it is very rare for the anesthesiologist to encounter, and its occurrence is probably less than once in their life time (statistically, 1/100,000). Responsible medication are scsamethonium (depolarizing muscle relaxant) and volatile anesthetics. It is said that it occurs due to the genetic mutation in RYR1, and excessive release of calcium in skeletal muscle and the obstruction of reuptake is the responsible mechanism. It doesn't necessarily happen in their first anesthesia, and we should note that some patients suffer from it in their second anesthesia. Because it is related to the gene mutation, it is important to check their family as well, when we found one patient. The causes of death by hyperthermia are below.

- Within several hours: Cardiac arrest due to severe acidosis or hyperkalemia, pulmonary edema and DIC

- Within several days: Cranial nerve damage due to hypoxia, cerebral edema, kidney failure due to myoglobinuria, etc. within several days.

Urine Volume

It is especially necessary to measure the urine volume for the surgery longer than two hours. It reflects the volume of the amount of fluid in the patient. Therefore, if the surgery is expected to last shorter than approximately 2 hours and to have little blood, urine catheter is not necessary. It goes without saying this, but it any kind of treatment or procedure is somehow invasive, so it is better if we can do without them. If the surgery is expected to be less than 2 hours and no urine catheter was placed in the patients' body during the surgery, and turns out to be longer than expected, it is necessary to measure the amount of the urine. The way to major the urine volume is ultrasound, and if it is more than about 400ml, we should assume that patients' bladder is already near their limitation.

If you expect to have massive bleeding during the surgery, it is necessary to use the urine catheter to measure the amount of the blood or fluid within their body, and if less, try to judge what is happening by BP and the amount of infusion.

It is also subject to change due to the patients' kidney condition. Diabetes or chronic hypertension can be the cause of kidney dysfunction, and as the result, urine volume will be less, so it is important to know the patients7 condition beforehand.

SpO2

It is to monitor blood oxygen. If low (below 90), check ABCDE. "A" stands for Airway, and the definition is having no obstruction in the airway. Of course, when anesthetizing, we make patients to lose their airway on purpose, which comes from glossoptosis because of the luck of consciousness, when the brain is affected by the anesthesia from cerebral level. The figure of pulse oximeter is displayed tens of minutes behind the real one. This time lag can be longer when measured on foot, hypoventilation and hypothermia.

When SpO2 is low, the biggest problem is the hypo-oxygenation of the brain. Possible causes are disorder in ventilation machine, miss evaluation of the patients' respiratory function and miss-setting the machine with the misevaluated calculation(COPD, asthma), tension pneumothorax, atelectasis, pulmonary embolism (leg compression to all patients), heart dysfunction. It is also important not to rely too much on the SpO2 monitors, and try to know Hb level as well. SpO2 shows the percentage of Hb that is connected with oxygen, so it doesn't directly reflects the oxygenation of the patients. Therefore, it is also important to know the amount of carrier of the oxygen, which is Hb, in the blood as well.

This monitor is important from the very beginning of the anesthesia until after the evacuation to know the oxygenation of the patients to judge whether they are breathing by themselves or not.

Exhaled gas monitor

Density of O2/CO2/anesthesia

- Capnometer (CO2)

Exhaled anesthesia monitor: it is assumed that ”end-tidal anesthetic gas” ≒ “alveolar anesthetic gas concentration” ≒ “brain anesthetic gas concentration”. Therefore, by monitoring end-tidal, you will know the oxygen concentration in the brain, and it will also show the depth of anesthesia. Excretion of the anesthesia from their body is done almost all by breathing out, so it is possible to know how much anesthesia is left in the patients’ body. Below, I will show each phase in the capnometer.

Ⅰ Beginning of exhale…It reflects CO2 in the dead space. If above 0, it means that a patient is re-inhaling the expiratory air.

Ⅱ Steep exhale…It reflects CO2 level of mixed end-tidal air and alveolar air. If the curve is milder, possible factor is airway constriction. (Airway constriction, COPD). If a patient have COPD, the curve will be milder, and we will not be able to see the EtCO2 of the patient. In addition, the basal pressure will be higher and higher, since the patient doesn’t have much time to exhale. Therefore, by decreasing the respiratory rate, we expect to see EtCO2 of the patient, and try to let them have enough time for expiration. Another solution for the rise in the basal pressure is to disconnect the intubation for a while so that patients’ lung will shrink enough.

Ⅲ Mild exhale…It reflects CO2 level of alveolar. If increasing constantly, possibility is chronic obstructive pulmonary bronchitis or asthma, which enable the ventilation of peripheral airway. The highest point is PETCO2

Ⅳ Beginning of next inhale…It is the phase that shows steep decrease

PETCO2↑…alveolar hypo-ventilation, re-inhaling the exhalation, high BT

PETCO2↓…hyper-ventilation, low BT, pulmonary embolism and low CO

- Blood gas

PaO2↓/PaCO2↑

Hypo-ventilation: respiratory ventilation due to the medication, metabolic alkalosis and CNS disorders

Shunting: congenital heart disorders, atelectasis

Diffusion disorders: pulmonary fibrosis, pulmonary congestion

$PaCO_2\downarrow$: hyperventilation, metabolic acidosis

Transesophageal echo cardiography

It is used for those who have problem in their heart or aorta, and it is also possible to see the portal vein. Percutaneous echo will not be able to see portal vein and four-chamber view.

BIS monitor

It is used to measure the awareness of the patients during the anesthesia. Ideally, BIS should be kept between 40 and 60, which is proved to have good post-operative outcomes, such as less complications and longer prognosis. Below I write the rough major how BIS correlates with the patients' status.

BIS 100: Arousal and alert

BIS 60: Below 60 is moderate hypotonic level

BIS 40: Deep hypnotic level

BIS 0: Deep anesthetic level

If intra-operative BIS continued to be lower than 40, it means patients need more time to be awake. On the other hand, if it continues to be higher than 60, it possibly means that patients are awake during the surgery, and the worst case is that they are feeling the pain intra-operatively.

There are some other ways to know the patients awareness beside BIS, such as Heart Rate, Blood Pressure, and the movement of the patients' body. For example, if patients are nearly awake, there sympathetic nurve will be activated, and the Heart Rate and Blood Pressure will goes higher. They also moves there body to show their pain or their awareness. However, patients will not be able to display their pain or awareness if they have muscle relaxant.

We should always take it into account that BIS is not always reliable. Being monitored through their forehead, it is subjected to change due to hair, blood or antiseptic solution between the skin and the electrode. It is subjected to change due to the operative procedure, for example, I saw some patients who had around BIS 70 during the surgery when the surgeons were touching there brain or neck. Therefore, we should always think about the awareness of the patients comprehensively, and not just rely on one monitor.

However, majoring BIS itself is sometimes important to show the regards from the anesthesiologist. Anesthesiologist have to take it into account that the awareness of the patients intra-operatively might lead them to be sued.Especially when using muscle relaxant, it is difficult to know the patients' awareness. If the patients cannot display their pain in their awareness, that

means even if they are really painful, they have no way to tell to the people surrounding, which might result in severe PTSD. Therefore, it is important for the anesthesiologist to show others that they are doing as much as they can during the surgery.

Awake craniotomy

The purpose of awake craniotomy is to prevent surgical brain function impairment and precisely excise lesions in order to increase the patient's prognosis and quality of life. For anesthesia management, we aim to make patients safe in the first place, eliminate psychophysical distress and carry out necessary surgery.

To obtain adequate analgesia through local anesthesia, a large amount of local anesthetic is required to perform scalp blocks and infiltration anesthesia, and have to pay attention to local anesthetic poisoning. Meanwhile, awake craniotomy prevent side effects such as nausea, vomiting and convulsions and deal promptly at emergence. We should note that if necessary, the awake craniotomy should be stopped promptly and the transition to general anesthesia should be considered.

Convulsion is one of the most serious complications among awake craniotomy. Cotinuous convulsion leads to respiratory arrest, and in the case that has difficulty doing artificial respiration, it will result in fatal consequences.

Neurolept anesthesia

Procedure: Doroperidol (Dopamine receptor blocker) + fentanyl (opioid)

Intensive neuron blocker and analgesics will make the patient awake but indifferent to the environment and painless. Patients can communicate with the operator.

Rapid Sequence Intubation of the tract

Adaptation: Full stomach

Procedure: A line, Deep breath with O2, head up/cricoid pressure/ketamine or tiopental, Suxametnium after, intubation and release the cricoid pressure, drainage of the stomach

Awake intubation

Adaptation: Newborn, full stomach, technical difficulty of intubation, atlantoaxial dislocation

Procedure: After sedation (Fentanyl, Diazepam), surface anesthesia

Anesthesia awareness

Intraoperative arousal / memory is a consciousness during surgery, and that the onset of PTSD is a concern. There is very little intraoperative arousal in Sevoflurane (Anesthetic agent whose sedation effect is not affected by GABA concentration in the brain) On the other hand, propofol (Anesthetic agent whose sedation effect is affected by GABA concentration in the brain) and TIVA is likely to cause intraoperative arousal.

It is reported that the incidence of intraoperative arousal decreases when the BIS value is maintained at 60 or less. However, since the analysis is based on the frontal robe of the brain, BIS can be an indicator of the sedative action from the thalamus to the cerebral cortex region, but not as an indicator of intraoperative memory and amnesia involved in limbic system, hippocampus, amygdala.

Patients are likely to have individual differences in anesthetics where sedation is likely to be affected by intracerebral GABA concentration, because there is a possible difference in the balance between brain excitement and suppression due to anxiety, stress, pain, etc.

It is important to consider not only sedation and analgesia but also amnesias for prevention of intraoperative arousal / memory. In the case of intraoperative arousal, it is important to show objective explanation and feelings of sympathy in postoperative interview, and consultant to psychiatry is conducted when strong anxiety

Difference of medical education and system

The difference of medical education

There are some difference in medical education between Japan and Netherland, and I would like to explain some of them.

First, medical school in Netherland is rather easy to get in, but hard to graduate from compared to Japan. In Japan, it is difficult to enter medical school, but quite easy to graduate from, which means that the number who entered medical school is almost equal to the number of those who

graduate from medical school. In Netherland, on the other hand, the number of those graduate from medical school is around 60% of those who enter, and the exam to proceed to 4th grade from 3rd grade makes it difficult for medical students to move on to intern. In Netherland, they have 3 years for intern, which Japanese have on their 5th and 6th year. 4th year is for observing from outside, like Japanese intern, 5th year is for the experience outside (not necessary outside), and 6th year is more practical, for example in surgery, they have to be sanitized and assist the surgeon to do the operation. I personally did intern in the department of Anesthesiology, and there, I had a chance to do urine catheter, intubation, and a short term control of general anesthesia. Therefore, it is comparably easy for the medical student to move on to their work after graduation. In Japan, it is often said that the intern cannot do anything in the beginning, and they say that it is because medical students didn't study enough. However, especially when I see the medical students abroad, it is very natural that they cannot do anything in the beginning, and the education system has to be blamed, not the young doctors or the medical students.

Second, they have the system to accept many foreign students into their medical school and there are two type of education program to become a doctor. One is for Dutch, and all education is done in Dutch, and there are approximately 200 students in a year. The other is for foreign students, and the former 3 years of education is in English, and in the end of 3rd year, they have examination for Dutch, and those who passed can move on to clinical intern, which starts from 4th year. Therefore, the students will be mixed up from 4th year, and many of them are from abroad, not only from EU. Interestingly, tuition fee for those from outside EU has to pay 32,000 euros annually, compared to 2,000 euros per year for those from EU. There are many people from the Middle East, and they say that they get financial support from the king and they only pay 2,000 euros annually and others are covered by the king, which is same amount of money with those from EU.

Therefore, the medical education system in Netherland is useful for medical students to develop their ability both culturally and educationally. I think they are relatively easy to work in the future, and to develop multi-cultural way of thinking and the ability to speak English, which all Japanese struggle after they start working.

The difference in medical system and the way of thinking

In Netherland, all population is covered by health insurance, and basically, everybody have free access to medical care. In Japan, we also have national health insurance, but basically everybody under 75 years old have to pay at 30% of medical cost and those above 75 year old will pay 10%. The difference is not only the amount of the payment that patients pay, but also the structure of the medical system itself is completely different from that of Japan.

One example for such big difference is the pathway of seeing doctors. In general, people have to see general physician first, and the doctor will decide they should be referred to the secondary hospital or above. It is possible for the patients to go to the higher level hospital directory without referral letters from the GP, but it costs extra fee, is 360 euro per year. Only in the real emergency

cases emergency case, they can go to secondary hospital or above directory, and there is no need to consult the family doctor in advance.

The role of the family doctors in Netherland is quite important, and about 95% of the patients are treated by them, although the medical expense spend on those treatment is around 5%. There are approximately 8,000 GP in Netherland, and population is 16 million, so each GP covers about 2,000 people on average. GP has some kind of territory and the number of people GP has extremely important for GP, because they are paid certain amount by the health insurance just by the fact that they cover certain amount of people (Capitation). For example, if GP get 50 euros/person/year by registering one person, it will be 100 thousand euros if one GP has 2,000 patients, even if they do nothing with some of them. Of course, besides the capitation, GP get paid also by the daily treatment (called Fee of Service), and also by the primary care consortia, which is evaluated by the performance of the controlling of chronic disease, such as HT and diabetes (it is called Pay for Performance.) Therefore, it is difficult for the outsiders to join the "market."

Another difference of the medical system Netherland has is the luck of annual medical check-up system compared to Japan. In Netherland, indeed, they offer the check-up for colon cancer and breast cancer, etc. However, they don't have the check-up system for prostate cancer and so on, since they think is not necessary because many people die before the effect of the cancer become enormous, and the public medical budget might be used to cure unnecessary cancer. I think it is quite reasonable to have that kind of idea, and Netherland only adapt the check-up that they think is really necessary based on the medicine. Such way could be one of the options for Japanese government to choose the priority in order to deal with the aging society and the expanding medical costs. Such difference in the way of thinking has been a problem for Japanese workers in Netherland. Japanese expect to have medical check-up annually, and they need those result to know there timely change in there body to keep following up after the go back to Japan.

This is just one example of the difference in the way of thinking between Japanese and Dutch, which makes it difficult for Japanese to work in Netherland for a few years. The difference is also apparent in the field of obstetrics and Gynecology. In Netherland, people don't go to the hospital to have a baby, and instead, they adapt midwives. According to these, Japanese try to create doctors who know the system and the culture in Japan, and they try to enhance the interaction of Dutch medical students and Japanese culture.

My way of life as an intern

Unfortunately, in the department of anesthesiology, students are scheduled to have their own operation room with the supervisor-of-the-day, so I didn't actually have the same supervisor every day, and I didn't have enough chance to contact with other students, and it was rather difficult for me to create consistent relationship with other students or doctors. Especially, anesthesiologist always go out of the operation during the operation to have some coffee or do their work, so I didn't have much time to talk with them. In addition, due to the different way of thinking,

students have to be active, and they have to ask for permission if they want to do anything. On the first week, it was very hard for me to understand the system, but on the 2nd and 3rd week, I managed to know how to, and on the last week, I think I was active enough to ask for anything, which I think is a big progress. I was also glad to have nice anesthetic nurses, who help anesthesiologist. While anesthesiologist go out to have some coffee, they stay in the room and look after the surgery. I was able to talk with them a lot, and I was able to be friends with some of them.

Conclusion

During the stay in the Netherland, I was able learn many things both academically and culturally. As for academic aspects, even though all the patients I saw was stable during the surgery, I was able to learn pharmacology of the medication and to know what is happening in the patients' body based on monitors. As for culturally, I could be aggressive enough to ask for the permission to do many things, and talk with many doctors and nurses, which I felt was self-introduction played an important part. I would like to thank everybody who were in charge of this program, especially Dr. Kishimoto, who was kind enough to support us financially. Without his support, I won't be able to study in Netherland and have such enormous experience. Thanks to what I have achieved In Netherland, I will promise to be excellent doctor on the point of academic point of view and personality.