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Monitoring maintenance of sevoflurane inhalation anesthesia in controlling hemodynamic stability of blood pressure and intra-opearting pulse of maxillary reconstruction at Yogyakarta air force central

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Abstract. Maxillary reconstruction is a procedure to restore lost volume, surface, and components in the upper jaw. This procedure aims to support and maintain oral functions, such as speaking, swallowing, and chewing, cover soft tissue, and provide volume. Maxillary reconstruction can be done in various ways, such as: RAFF, Free rectus bone graft, Obturator insertion, Tissue engineering procedures. The frequency of malignant maxillary sinus tumors is estimated at around 0.2 - 0.8% of all malignancies throughout the body, or 3% of upper aerodigestive tract malignancies. Commonly used general anesthesia is inhalation anesthesia. This inhalation anesthesia has the advantage of its potency and concentration which can be controlled through a machine, with dose titration to produce the desired response. The purpose of this study was to determine how Monitoring Maintenance of Sevoflurane Inhalation Anesthesia in Controlling Hemodynamic Stability of Blood Pressure and Intraoperative Pulse of Maxillary Reconstruction at Yogyakarta Air Force Central Hospital. The method in This research has a case study research design and this study was conducted based on a case study used as a research case, using anesthesia care sheets in conducting research observations. From the results of the study it can be concluded that the administration of maintenance inhalation anesthesia in the case report that inhalation anesthesia with sevoflurane is very good, the side effects caused by inhalation anesthesia do not cause a significant decrease in condition, so that anesthesia with sevoflurane can be used in maxillofacial surgery. At the pre-anesthesia stage, patients are also given antibiotics to prevent post-operative infections.

1 Introduction

One facial feature that influences a person's face shape, particularly the midfacial region, is the maxilla. The maxilla has an aesthetic purpose, but it also maintains the airway and

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facilitates speaking, swallowing, and chewing. Malignant transformation is possible in the mucosa lining the maxillary sinus, much like in other organs of the body. 1. Trauma, illness, pathological alterations, or the removal of sinonasal malignancies can all result in maxillary defects. Malignancy in the maxillary sinus (located in the maxillary bone) is most often found among paranasal sinus malignancies. The frequency of malignant maxillary sinus tumors is estimated to be around 0.2 - 0.8% of all malignancies throughout the body, or 3% of malignancies of the upper aerodigestive tract. At the ENT-KL Oncology Polyclinic, Dr. Hasan Sadikin Hospital, Bandung, During the period 2006-2010, malignant synovial tumors were the second most common (365 or 18.9% of patients) among new patients who came for treatment. The first place was occupied by nasopharyngeal carcinoma (783 or 40.5% of patients), while the third place was oropharyngeal carcinoma (334 or 12.1% of patients) and the fourth was laryngeal carcinoma (206 or 10.7% of patients) (19). The general anesthesia that is often used is inhalation anesthesia. The frequency of maxillary sinus cancer is a low fraction (0.2%) of human malignant tumors and only 1.5% of all head and neck malignant neoplasms, making it a relatively uncommon neoplasm. We must increase oral stomatologists' general understanding of maxillary sinus cancer because it is extremely common in Asian nations. 60% to 70% of cases occur in the maxillary sinus, with 12% to 25% occurring in the nasal cavity, 10% to 15% in the ethmoid, and 1% in the sphenoid/frontal sinuses. Some chemicals and viruses are the main risk factors for squamous cell carcinoma (SCC) from the maxillary sinus (MxSSCC), which primarily affects middle-aged men from Eastern countries (ages 55 to 65).

Maxillary carcinoma has the worst prognosis and one of the highest rates among paranasal sinus carcinomas. Understanding the differential diagnosis of these lesions is crucial for oral physicians. According to the International Agency for Research on Cancer's (IARC) 2020 Globocan data, oral cavity cancers are comparatively uncommon tumors (354,864 new cases, 2.0% of all malignancies), with a 2.3:1 incidence ratio between men and women. Southeast Asians rank 13th out of 16 cancer types based on age and gender disparities in the average incidence and death that occur globally (3.2 for men and 1.8 for women). Malignant tumors of the oral cavity rank eleventh among all cancers in Asia. In Indonesia, new cases of oral cavity malignant tumors range from 1.5% of all cases of malignancy with a mortality rate reaching 1.1% of all deaths due to malignancy (4). This inhalation anesthesia has the advantage of its potency and concentration which can be controlled through a machine, with dose titration to produce the desired response (5). Commonly used inhalation anesthetics are isoflurane and sevoflurane (5). Sevoflurane is a halogenated inhalation anesthetic that is FDA-approved for induction and maintenance of general anesthesia in adult and pediatric patients for inpatient and outpatient surgery. Sevoflurane is a volatile anesthetic that provides hypnosis, amnesia, analgesia, akinesia, and autonomic blockade during surgical and procedural interventions. This activity explains how sevoflurane works and highlights the role of the interprofessional team in the safe delivery of anesthesia (6).

2 Researche Method

This research has a case study research design and this research is conducted based on a case study used as a research case, using anesthesia care sheets in conducting research observations. A case study is an empirical study that investigates contemporary phenomena in a real-life context. The case study research method is the right strategy to use in research that uses the main research question "how" or "why", it takes little time to control the events being studied, and the focus of the research is contemporary phenomena. In the case study method, researchers focus on the design and implementation of the research. The research is qualitative with cases observed including single or multiple cases whose observations focus on human behavior and environmental settings.

3 Case Report

Patient “F”, a 14-year-old male was brought by his parents to the Emergency Room of the Yogyakarta Air Force Central Hospital on September 10, 2024 in a state of unconsciousness after a traffic accident. The patient's family said that after the accident the patient suddenly became weak, vomited projectile blood once and upon arrival at the Emergency Room the patient fainted. The patient's family admitted that the patient had no medical history, had never consumed drugs, and had never undergone surgery. From the physical examination, the results of the level of consciousness were somnolent, blood pressure 117/84 mmhg, pulse 84 x / minute, temperature 36.2o C, respiration 20 x / minute, weight 60 kg, height 165cm, performed 6B, the results of Breathing were: a) Ability to open the mouth <3cm, Mallampati score 3, The client is not short of breath, Vesicular breath sounds, the mouth area has a lot of blood fluid flowing.

From the radiological examination, the results of the supporting examination of the CT Scan of the head of the maxillary hematosinus, ethmoidalis, and the right and left nasal cavity. Fracture of the alveolar proc et maxillary os right and left, the alveolar proc et mandibular os right, nasal septum, frontal os. The patient was diagnosed with a Mandibular Fracture, and the Maxillary Mandibular Reconstruction Action plan will be carried out. The patient was given education, namely: complete information about his illness (what is OA, causes, risk factors, course of the disease, complications, treatment). The patient is prepared before the procedure, the initial planning preparation is carried out by the anesthesia team by checking the completeness of the patient's status, the patient has been fasting since 23.00, the patient is given an IV No. 20 on the right-hand using Ringer's lactate fluid, the patient has changed clothes, a surgical cap, and a mask, positioning the patient. The patient is ready to be anesthetized using general anesthesia techniques with a breathing apparatus installed during the procedure.

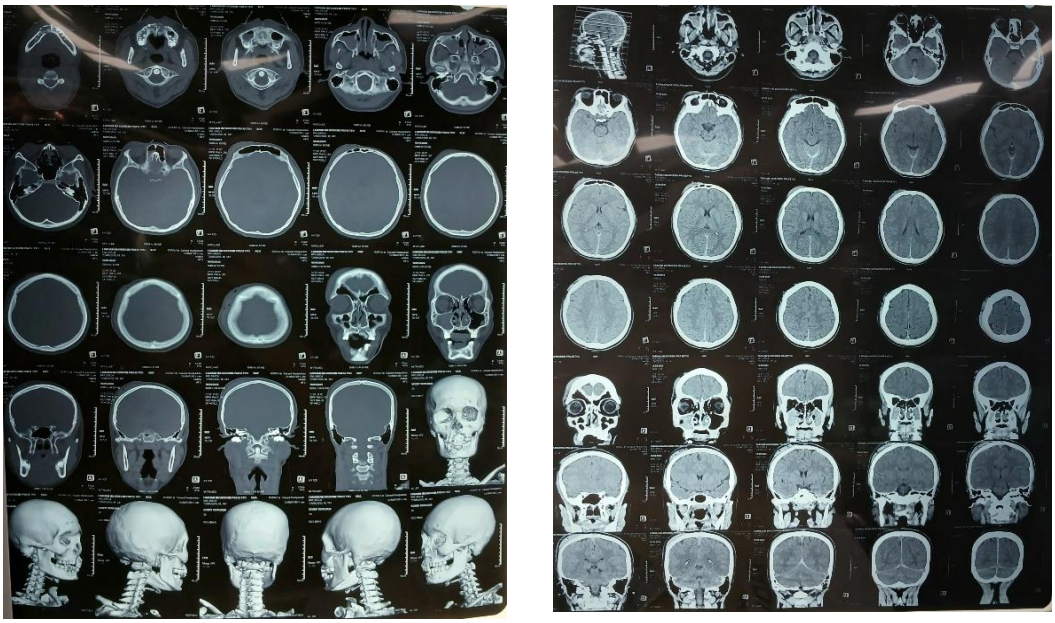

Figure 1. CT Scan image

AMPLE examination assessment:

Allergies : the patient said he had no history of allergies, either food allergies or drug allergies
Medication : the patient said he had never taken medication
Past illness : the patient said he had no history of diseases such as asthma, high blood pressure and diabetes mellitus
Last meal : the patient said he had not eaten since eleven at night, and last drank at five in the morning
Environment: the patient said he had smoked, but was not active and consumed alcohol but not often

The administration of medication by the anesthesia team during the procedure is the administration of antiprophylactic drugs Cefazolin 2 grams (IV), induction drugs Fentanyl 200 mcg (IV), Propofol 100 mg (IV) Roculax 30 mg (IV), Lidocaine 20 mg (IV). Antiemetic Ondansetron 4 mg (IV), Ranitidine 50 mg (IV). Anti-inflammatory Dexamethasone 10 mg (IV). Analgesic Tramadol 100 mg (IV). Other drugs Ephedrine, Atropine Sulfate Tranexamant Acid. Fluid and Blood Preparation, Ringer Lactate Gelafusal Nacl Paracetamol, PRC Blood 2 Bags. Preparation of intraoperative maintenance drugs Propofol, Roculax. After the preparation is complete. This procedure lasted for 2 hours, during the procedure, close monitoring was carried out by the anesthesia team both at the time of induction, durante and post-operatively. During the durante operation monitoring, the patient's condition was obtained with vital sign monitoring BP: 89/68 mmHg, N: 64 x / min, SpO2: 96%, S: 36.50c, Pale cold acral, RL infusion installed, - The patient underwent Maxillary Reconstruction surgery with general anesthesia ETT size 7.0.

During the durante operation, the anesthesia team provided intervention to the patient by Monitoring signs and symptoms of decreased cardiac output, Observing blood pressure and MAP, pulse, respiration, and SpO2, Monitoring ECG images, Monitoring fluid status (intake output), Monitoring bleeding, Monitoring signs and symptoms of shock, Checking the level of peripheral tissue perfusion, Ensure that the IV flow is functioning properly, Collaboration in providing fluid therapy, Collaboration in providing vasopressors, Collaboration in providing anti-arrhythmic drugs. During the intervention by the anesthesia team, a re-check was carried out regarding the patient's general condition during the durante. The results showed that the patient was intubated with ETT number 7, TV 400 ml, RR 16x/minute SpO2 99%, Blood Pressure 110/78 mmhg, pulse 80 x/minute, Syringe pump installed Propofol 2ml/h, Roculax 1ml/h, Fentanyl 1ml/h Regular ECG rhythm, the patient's condition was relatively stable during the durante of the operation.

During post-anesthesia assessment after the procedure was completed, the patient was extubated with adequate respiratory conditions and the patient was immediately transferred to the intensive care unit (ICU) for further monitoring, the monitoring carried out included hemodynamic monitoring (blood pressure, pulse, temperature and respiration) of post-operative patients. after being transferred to the intensive care unit, the patient was given oxygen 5 liters/minute using an oxygen mask.

4 Discussion

Planning fracture repair and detecting and diagnosing maxillary fractures depend on imaging. Magnetic resonance imaging (MRI), computed tomography (CT), and plain film radiography are among the available options. The benefit of three-dimensional imaging is that it can show the extent of fracture displacement and provide a better image of surrounding structure damage, including entrapment of muscles, nerves, and adipose tissue. A 15/30 occipitomental view is utilized to evaluate a suspected zygomatic-maxillary complicated fracture. CT imaging may be the recommended technique for children since it can be challenging to

perform and interpret these simple films on young patients, which may cause a delay in the diagnosis of facial fractures. The gold standard is computed tomography if a Le Fort fracture is suspected and there is a worry that the orbit or orbital floor may be affected.

The most reliable method for checking for fractures in bones is CT. Even though they shouldn't be used as a first line of treatment, plain radiographs are suitable in situations where surgery is done in a hostile environment or if access to a CT scanner is restricted. MRI is not useful for assessing bone structures and is rarely used in trauma conditions. Ignoring the slice size is a typical CT scanning error. In all perspectives (axial, sagittal, and coronal), the shortest slice feasible should be taken; this is typically 0.5 mm or 0.625 mm. The typical head CT slice of 2.5 mm is excessively big and will overlook a lot of fractures. Additionally, a 3-D reconstruction should be carried out since it frequently clarifies fractures that might not be apparent when looking at the slices from a single perspective.

Based on the case raised in this study, that in establishing a diagnosis, a radiological examination is carried out, in special cases like this the patient is given an x-ray examination to see the overall condition faced by the patient, so that the treatment that will be carried out by the doctor and other medical teams will be in accordance with the patient's needs. In terms of the level of difficulty in handling pediatric patients, imaging of x-ray images will affect the patient's condition, which in handling must be carried out quickly so that it is delayed due to this condition, so that maximum efforts made will be ineffective for the patient's condition which should have received faster treatment.

Facial trauma is a common case, causing problems in medical and social life. The increasing incidence is due to the increasing number of motor vehicles that can cause traffic accidents. Blunt trauma that is quite hard is the etiology of the trauma. Trauma is the fourth cause of death, can occur at all ages, especially 1-37 years. Almost 50% in the United States is caused by traffic accidents. The maxilla or upper jaw is a paired bone (**Error! Reference s ource not found.**). The maxilla has a pair of cavities in the form of the maxillary sinus, upwards connected to the frontal bone and nasal bone, laterally to the zygoma bone and inferiorly - medially to the frontal process of the maxilla. The maxilla is a thin bone, on the lateral side it is thicker and denser, in this section it is supported by the zygomaticomaxillary. Based on the results of the case report obtained that the patient had experienced a decline in condition during the operation, but the decline in the patient's condition did not last long, and collaborative actions were carried out in providing interventions related to the patient's condition, so that re-observation of the patient's condition was carried out and the patient's condition began to stabilize again (**Error! Reference source not found.**). During the o peration using inhalation anesthesia with sevoflurane as maintenance, in this case according to the theory sevoflurane is an inhalation anesthetic, it can have an effect on hemodynamics, namely:

Sevoflurane can lower blood pressure and cardiac output, especially at high doses. This happens because sevoflurane can reduce systemic vascular resistance. Sevoflurane can improve perioperative hemodynamic stability in elderly patients with diabetes undergoing non-cardiac surgery. Sevoflurane has no significant systemic hemodynamic effects at clinically administered doses (**Error! Reference source not found.**).

In addition, sevoflurane also has several advantages, namely: Rapid and pleasant induction, accelerate recovery, Strengthen the effects of sedatives, narcotics, and nondepolarizing muscle relaxants. However, sevoflurane also has several side effects, such as: Respiratory tract irritation, can trigger coughing, apnea, and laryngospasm, can be associated with the etiology of postoperative diffuse alveolar hemorrhage (**Error! Reference s ource not found.**). This is in line with research conducted by Kenichi Satoh who in his research entitled Anesthesia Management of Patients with Sick Sinus Syndrome During General Anesthesia for Maxillofacial Surgery in his research said that during the procedure, it was discovered that the majority of participants had a drop-in pulse, which was described

as severe bradycardia or hypotension. Anesthesiologists typically administer atropine sulfate or adrenergic agonists intravenously; ephedrine hydrochloride is the preferred medication among adrenergic agonists(**Error! Reference source not found.**). During general a nesthesia, we administered three injections of ephedrine hydrochloride when the patient's heart rate dropped to 36 to 40 beats per minute and his systolic blood pressure fell below 80 mm Hg. We chose not to inject atropine sulfate because we wanted to quickly raise both blood pressure and heart rate at the same time. We were ready to provide ephedrine hydrochloride and atropine sulfate as well as to constantly inject dopamine or isoproterenol (**Error! Reference source not found.**).

This is in line with research conducted by Nurul Fatimah (2012) which in her research stated that the initial pulse rate and blood pressure increased, but the increase in pulse rate and blood pressure after passing the induction phase returned to normal, this is in accordance with the theory that concluded that in administering general anesthesia with sevoflurane for pulse rate and blood pressure are more stable so that in choosing sevoflurane anesthetic gas is a good choice because it does not have too high side effects on the patient's hemodynamic condition during intra anesthesia (**Error! Reference source not found.**).

This study is also in line with the study conducted by Nurul (2022) which in his study stated that this study found that blood pressure decreased from 102.71 to 94.56 during induction. This happened in systolic blood pressure from 139.19 to 126.10 and in diastolic blood pressure from 84.83 to 78.94. From the changes that occurred in blood pressure, there were no drastic changes but more stable changes. This is in accordance with the statement quoted in the research journal (**Error! Reference source not found.**) changes in MAP in the s evoflurane inhalation anesthesia group were smaller than the isoflurane group from the induction phase to the incision phase 15 minutes of anesthesia, l changes in pulse rate with the initial pulse rate of 81.25 to 81.15. There was no change in pulse rate, in this case the pulse rate with sevoflurane anesthesia can be said to be stable, this is in accordance with research (Hapsari, 2011) there was no significant change in pulse for the sevoflurane group from before anesthesia to the 60th minute. In oxygen saturation, in this study the change in oxygen saturation did not experience a significant change with oxygen saturation before induction, namely with an average value of 98.75 to 98.71 at the time of induction. In accordance with research (Setiawan, 2012) there was no significant difference in oxygen saturation changes between the isoflurane and sevoflurane anesthesia groups in the induction phase, five minutes after incision and 15 minutes after incision (**Error! Reference source n ot found.**).

This study is in line with the study conducted by Alidon (2024) who in his study stated that the results of the study showed changes in patient hemodynamics before and after general anesthesia using sevoflurane at Siloam Sriwijaya Hospital Palembang in 2023, namely 39 (59.1%) respondents did not experience changes in systolic blood pressure and 40 (60.6%) respondents did not experience changes in diastolic blood pressure. Most respondents experienced significant changes, namely 42 (64.6%) respondents experienced significant changes. All respondents did not experience significant changes in temperature, namely 66 (100.0%%). Most respondents did not experience significant changes in respiration, namely 50 (75.8%) respondents. All inhalation anesthetics lower blood pressure due to vasodilation and myocardial depression, with varying gradations. Inhalation gases affect heart rate directly through effects on the SA node or indirectly through shifting autonomic nervous balance. In clinical practice, if the depth of anesthesia has been achieved, the heart rate will generally decrease. a decrease in heart rate does not always mean depression in the heart, but is likely due to a decrease in sympathetic tone due to adequate anesthesia (**Error! Reference source n ot found.**). The effect of sevoflurane on the cardiovascular system is quite stable. Many studies have proven that sevoflurane is cardio protective in cardiac surgery. Sevoflurane can reduce myocardial muscle contractions, thereby reducing myocardial oxygen consumption,

reducing peripheral vascular resistance and reducing arterial pressure, but the effect is smaller than isoflurane. Sevoflurane also has a bradycardia effect, although minimal (**Error! R eference source not found.**). Similar to isoflurane and desflurane, sevoflurane can cause cerebral vasodilation, thereby increasing cerebral blood flow and intracranial pressure in normocarbia, but several studies have also shown a decrease in cerebral blood flow. High concentrations of sevoflurane (> 1.5MAC) can interfere with cerebral autoregulation.

5 Conclusion

Based on the results of the study, it can be concluded that the administration of maintenance inhalation anesthesia in the case report that inhalation anesthesia with sevoflurane is very good, the side effects caused by inhalation anesthesia do not cause a significant decrease in condition, so that anesthesia with sevoflurane can be used in maxillofacial surgery. In pre-anesthesia, patients are also given antibiotics to prevent post-operative infections. Furthermore, in patients who are not fasting enough, there is a risk of aspiration so that ondansetron is given to reduce the response of nausea and vomiting due to fasting in patients who will undergo surgery for ondansetron administration is given at a dose of 4 mg to 8 mg. Then in intra-anesthesia, intubation is performed using the Sellick maneuver method to prevent pulmonary aspiration. In intra-anesthesia, monitoring of the patient's respiratory status and other hemodynamic conditions is also required as a standard when general anesthesia is performed. Monitoring of vital signs carried out during surgery can help: Overcome the risk of increased intracranial pressure, Maintain the patient's condition stable, Maintain the patient's blood pressure according to their condition and level of risk. Monitoring of vital signs is also important after surgery to: Detect post-operative complications, Assess the effectiveness of pain management, Determine the patient's readiness to be discharged. The results of monitoring Vital signs during and after surgery are recorded in the patient's medical record. In post-anesthesia, an assessment of the risks that occur and their handling is carried out, such as the risk of falling, installing a safety bed and accompanying the patient (7).

Based on the results of this study, so the researcher hopes that this study can provide a positive influence on learning in operations that will be carried out in the maxillary area. and for further researchers, this study can be used as a reference in research related to the maxillary area.

References

1. Abosadegh MM, Saddki N, Al-Tayar B, Rahman SA. Epidemiology of Maxillofacial Fractures at a Teaching Hospital in Malaysia: A Retrospective Study. Biomed Res Int. 2019:9024763.
2. Aji Prima Putra AM. Manajemen Anestesi Perioperative. Jurnal Kedokteran dan Kesehatan Malikussaleh. 2022.
3. Bambang Harijono SC. Pengelolaan Perioperatif Anestesi pada Pasien dengan Pembedahan Hipofisis. Journal Nasional Indonesia. 2022.
4. Brunton G. Goodman & Gilman's The Pharmacological Basis of Therapeutics. 12th Edition. McGrawHill. 2020.
5. Latief. Petunjuk Praktis Anestesiologi. Edisi 4. Jakarta: Fakultas Kedokteran Universitas Indonesia. 2019.
6. Mangku G, Senapathi TGA. Ilmu Anestesia dan Reanimasi. Jakarta: PT Indeks. 2019.

7. Manurung HJ. Gambaran Perubahan Hemodinamika pada Pasien General Anestesi Menggunakan Isoflurane dan Sevaloflurane di RS X Palembang. Journal of Anesthesiology Tiara Bunda. 2024;1(2):1–10.
8. Morales JL, Skowronski PP, Thaller SR. Management of Pediatric Maxillary Fractures. J Craniofac Surg. 2019;21(4):1226–33.
9. Murphy C, O'Connell JE, Kearns G, Stassen L. Sports-Related Maxillofacial Injuries. J Craniofacial Surg. 2019;26(7):2120–3.
10. Nurul Fatimah. Efek Anestesi Sevoflurane dan Isoflurane terhadap Hemodinamik. 2020.
11. Oswari E. Bedah dan Perawatannya. Edisi 3. Jakarta: Balai Penerbit FKUI. 2020.
12. Peretti N, MacLeod S. Zygomaticomaxillary Complex Fractures: Diagnosis and Treatment. Curr Opin Otolaryngol Head Neck Surg. 2019;25(4):314–9.
13. Phillips BJ, Turco LM. Le Fort Fractures: A Collective Review. Bull Emerg Trauma. 2021;5(4):221–30.
14. Pramono. Buku Kuliah Anestesi. Jakarta: EGC. 2020.
15. Rizki Aulia. Perbedaan Status Hemodinamik terhadap Agen Inhalasi Sevofluran pada Pasien dengan Anestesi Umum di RSUD H. Hanafie Muara Bungo. Journal Anestesi. 2022.
16. Sirait. Buku Ajar Pemantauan Hemodinamik Pasien. Jakarta: FK Universitas Indonesia. 2020.
17. Vujcich N, Gebauer D. Current and Evolving Trends in the Management of Facial Fractures. Aust Dent J. 2021;63 Suppl 1:S35–47.
18. WHO. Strengthening Emergency and Essential Surgical Care and Anesthesia as a Component of Universal Health Coverage. World Health Assembly. 2018.
19. Yussy Afriani Dewi. Rekonstruksi Defek Pasca Maksilektomi. 2020.
20. Zaimi Ginanjar LRES. Distribusi Frekuensi Pasien Odontektomi dengan Anestesi Umum di Rumah Sakit Gigi dan Mulut Universitas Padjadjaran.