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PENGANTAR EDITOR

Salam sehat,

Alhamdulillah edisi ke satu volume ke tiga Jambura Medical and Health Science Journal kembali dapat diterbitkan. Sebagaimana pada edisi sebelumnya, maka jurnal terbitan Fakultas Kedokteran (FK) UNG pada edisi kali menerbitkan 2 *original article* dari sivitas akaemika FK UNG. Selanjutnya ada 1 *Review Article* yang ditulis oleh sejawat dari Yogyakarta. Terakhir ada 2 *Case Report* yg ditulis oleh sejawat dari Gorontalo. Hal ini menunjukkan JMHSJ juga diminati oleh para peneliti, akademisi, hingga praktisi dari berbagai penjuru Indonesia.

Topik yang diangkat pun bervariasi mulai dari kasus *congenital nephrotic syndrome*, kasus efusi limfoma primer yang menyerupai TB paru, tinjauan mengenai *deep brain stimulation* pada penyakit Alzheimer, inovasi modifikasi Kartu Jendral untuk pembelajaran anatomi, serta faktor resiko hernia inguinalis di salah satu rumah sakit pusat rujukan di Gorontalo. Semoga kedepan akan lebih banyak tulisan dari berbagai disiplin ilmu kedokteran yang diangkat dalam JMHSJ dari berbagai penjuru instansi. Hal ini diharapkan dapat menjadi indikator baiknya kualitas pengelolaan jurnal yang sebentar lagi akan diakreditasi pada indeksasi nasional (SINTA). Selamat membaca.

Gorontalo, 1 April 2024

Dr.dr. Muhammad Isman Jusuf,Sp.N

Chief Editor

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CASE REPORT **Open Access**

Congenital Nephrotic Syndrome: A Case Report

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ABSTRACT

Congenital nephrotic syndrome (CNS) is a rare disorder characterized by massive proteinuria, hypoalbuminemia, hyperlipidemia, and edema that occurs in the first three months of life. The incidence of CNS is about 1.5% of all cases of nephrotic syndrome in children, while the incidence in children is about 2 per 100,000. The pathogenesis of CNS is thought to be due to genetic defects in the components of the glomerular filtration barrier, particularly nephrin and podocin, which cause most similar cases. A perinatal infection may also cause CNS. The most common type of primary CNS is the Finnish type, inherited in an autosomal recessive manner. We report a case of a six-month-old male patient who presented with swelling of the face, abdomen, and genitals since the age of 3 months, which had worsened a week before admission to the hospital. There was no history of nausea, vomiting, fever, or seizures, and the child could drink milk. Physical examination revealed ascites with positive shifting dullness and pretibial, dorsum pedis, and scrotum edema. The liver and spleen were difficult to assess. Laboratory examination revealed leukocytosis ($27.8x10^3/\mu L$), anemia (7.7 g/dL), thrombocytosis ($537x10^3/\mu L$), hypoalbuminemia (1.5 g/dL), dyslipidemia (total cholesterol 374 mg/dL, HDL 7 mg/dL, LDL 69 mg/dL, triglycerides 1196 mg/dL), proteinuria (+3/300), and hematuria (+3/200). A history of urological ultrasound showed right and left nephropathy with mild hydronephrosis and ascites. To sum up, we reported male patient 6 months with congenital nephrotic syndrome. Chromosomal analysis is recommended in this case.

Keywords : Congenital nephrotic syndrome, glomerular filtration membrane defect, gene mutation

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Introduction

Congenital Nephrotic Syndrome (CNS) is a rare renal disorder that primarily affects infants within the first three months of life. It is characterized by excessive proteinuria, hypoalbuminemia, hyperlipidemia, and edema. CNS is classified into two types: primary and secondary. Primary CNS is linked to genetic mutations that affect the glomerular filtration membrane. The most common types of primary CNS are Finnish-type, diffuse mesangial sclerosis, and focal segmental glomerulosclerosis. Secondary CNS is usually associated with congenital infections or malignancies. Various factors can cause secondary CNS, including maternal systemic lupus erythematosus (SLE), autoimmune disorders, and neonatal autoantibodies. It is crucial to diagnose CNS early to prevent complications such as infections, thrombosis, and malnutrition.[1–3]

This medical condition can result in severe and life-threatening complications such as acute kidney injury, thrombotic disease, and infection. Therefore, it is crucial to provide appropriate treatment to replace the loss of fluid, protein, and electrolytes, regardless of the disease's symptoms and underlying cause. Infections can also cause CNS, so it is essential to rule out any infectious cause for better treatment outcomes. Patients with genetic causes of CNS have a poorer prognosis. In most cases, patients with CNS develop end-stage renal disease within the first few years to decades of life. The primary treatment goal is to reduce proteinuria, ensure proper nutrition, and prevent infection and thrombosis. ACE inhibitors, angiotensin receptor blockers, or indomethacin can help reduce protein excretion. Additionally, RAS blockade might help stabilize podocyte function in the CNS.[4]

Case

A 6-month-old boy came with swelling on the face, stomach, and genitals for three months before being admitted to the hospital, getting worse one week before being admitted to the hospital. There was no nausea, vomiting, fever, or seizures. He wants to drink milk with normal defecation and urination. His mother had pregnant him as a fifth child at the age of 37 years with routine pregnancy control at the obstetrician and regularly consumed vitamins and blood supplement tablets. There was no history of illness during pregnancy. His parents had two times cousins relationship. He was born spontaneously and cried immediately with an APGAR Score unknown. At delivery, he had a birth weight of 3.2 kilograms and a birth length of 48 centimeters. He had been drinking formula milk since birth and received Hepatitis 2, Polio l, Diphtheria Pertussis, Tetanus l, Haemophilus influenza I,

and BCG vaccines. There was no history of hypertension, frequent pallor, hair loss, joint pain, erythematous, oral ulcers, frequent fevers, and reddish urination. There was no family history of autoimmune disease, decreased consciousness, and photosensitivity. His mother had given birth to 5 children, and the patient's two brothers died at the ages of one year and three years with a history of swelling.

He had a body weight and height of 7.1 Kg and 61 cm, respectively. He had normal nutritional status and stature according to the BW/BH (between the median line and the -2SD percentile), BH/A (between the -2SD and 2SD percentiles), and BW/A (between the -2SD and 2SD percentiles). At present, he appeared moderately ill and conscious. The vital signs were assessed with the following results: BP: 90/60 mmHg, pulse rate 130 times per minute, breath rate 56 times per minute, temperature of 36.8 0C, and oxygen saturation of 98%. Abnormality was not found on the head, neck, chest, and extremities during the physical examination. However, his liver and spleen were difficult to assess regarding the presence of ascites with shifting dullness positive. Moreover, the scrotal edema significantly appeared.

The laboratory examination is depicted in Table 1-4. Severe leukocytosis, moderate anemia, thrombocytosis, hypoalbuminemia, markedly hypercholesterolemia, and hypertriglyceridemia with low HDL and LDL levels had been found. Moreover, significant microscopic hematuria and proteinuria had been revealed on his urinalysis examination.

Table 1. Complete blood count examination results

Parameter	08/03/2022	Unit Measurement	Reference
Leukocyte	27.8	10^3/µL	4.00-10.00
%Neutrophil	63.5	%	52-75
%Lymphocyte	29.9	%	20-40
%Monocyte	5.2	%	2.00-8.00
%Eosinophil	0.3	%	1.00-3.00
%Basophil	1.1	%	0.0-1.0
Erythrocyte	2.96	10^6/µL	4.00-6.00
Hemoglobin	7.7	g/dL	12-16
Hematocryt	24	%	37-48
MCV	82	fL	80-97
MCH	26	pg	26.5-33.5
MCHC	32	g/dL	31.5-35.0
RDW-CV	14.0	%	10.0-15.0
Platelet	537	10^3/µL	150-400
MPV	8.6	fL	6.50-11.0
Plateletcrit	0.46	%	0.15-0.50
PDW	15.8	%	10.0-18.0

MCV: Mean Corpuscular Volume, MCH: Mean Corpuscular Hemoglobin, MCHC: Mean Corpuscular Hemoglobin Concentration, RDW-CV: Red Cell Distribution Width-Corpuscular Volume, MPV: Mean Platelet Volume, PDW: Platelet Distribution Width.

Table 2. Albumin serum measurement (Follow up)

Parameter	08/03/2022	13/03/2022	17/03/2022	Reference
Albumin (gr/dL)	2.0	1.2	1.5	3.5 – 5.0

Table 3. Blood chemistry and electrolyte measurement

Parameter	08/03/2022	Unit Measurement	Reference
Blood Chemistry			
Random Blood Glucose	99	mg/dL	140
Ureum	66	mg/dL	10-50
Creatinine	0.74	mg/dL	L(<1.3);P(<1.1)
AST/SGOT	49	U/L	<38
ALT/SGPT	25	U/L	<41
LDH	589	U/L	210-425
Total Cholesterol	374	mg/dl	200
HDL Cholesterol	7	mg/dl	L(>55);P(>65)
LDL Cholesterol	69	mg/dl	<130
Triglyceride	1196	mg/dl	200
Electrolyte			
Sodium	134	mmol/L	136-145
Potassium	4.4	mmol/L	3.5-5.1
Chloride	116	mmol/L	97-111

Table 4. Urinalysis results

Parameter	09/03/2022	Unit Measurement	Reference
Colour	Dark Yellow		Light Yellow
pH	6.5		4.5-8.0
SG	1,022		1,005-1,035
Protein	3+	mg/dL	Negative
Glucose	Negative	mg/dL	Negative
Bilirubine	Negative		Negative
Urobilinogen	Normal	mg/dL	Normal
Keton	Negative	mg/dL	Negative
Nitrit	Negative	mg/dL	Negative
Blood	3+	RBC/ul	Negative
Leukocyte	Negative	WBC/ul	Negative
Vitamin C	Negative	mg/dL	Negative
Leukocyte Cast	6	HPF	< 5
Erithrocyte Cast	10	HPF	< 5
Cylindris Cast	36	LPF	
Crystal Cast	0	LPF	
Epithelial Cell Cast	51	LPF	
Others Cast	Bacteria = 25	ul	

Kidney ultrasonography on 15th March 2022 was conducted and revealed left and right kidney nephropathy (blurred corticomedullary differentiation), right mild hydronephrosis (dilated PCS), right velocity index 18.8 cm/s, right resistive index 0.75, left velocity index 15.7 cm/s, and left resistive index 0.71. His screened spleen and urinary bladder appeared normal, with visible free fluid in the intraperitoneal space.

Discussion

The six-month-old male patient was admitted to the pediatric ward of RSUP Dr. Wahiddin Sudirohusodo Makassar with a final diagnosis of congenital nephrotic syndrome. The patient's diagnosis was based on a thorough medical history, physical examination, and supporting tests. The medical history revealed a noticeable swelling on the face, stomach, and genitals three months prior to admission, which had worsened over the last week. The patient also presented with massive proteinuria, hypoalbuminemia, hyperlipidemia, and edema. These symptoms, along with the results of the supporting tests, led to the diagnosis of congenital nephrotic syndrome.

During the initial screening, regular blood tests revealed the presence of leukocytosis, anemia, and thrombocytosis. Leukocytosis is typically caused by inflammation in the kidney parenchyma, which is also supported by the urinalysis test that shows high thoracic sediment. Anemia in nephrotic syndrome can occur due to changes in iron and transferrin homeostasis, as well as the excretion of erythropoietin in urine. The excretion of iron and transferrin in urine reduces plasma transferrin levels, resulting in decreased plasma iron levels and hypochromic microcytic anemia. Loss of erythropoietin through urine can also cause erythropoietin deficiency anemia. Thrombocytosis can be categorized as primary (essential thrombocytosis) or secondary (reactive thrombocytosis). Although this patient may have reactive thrombocytosis, the possibility of primary thrombocytosis cannot be ruled out since no peripheral blood analysis or bone marrow aspiration has been done. Secondary thrombocytosis is observed relatively frequently in hospitalized children and is an increase in platelets without a primary cause but secondary to an underlying medical condition. According to various studies, essential thrombocytosis is more common in adults than in children by a factor of at least 60.

Nephrotic syndrome is a medical condition that can lead to various complications such as hypovolemia, shock, acute kidney injury, infection, thromboembolism, electrolyte imbalances, endocrine disorders, and anemia. The underlying cause of these complications is the excessive loss of proteins in the urine, including albumin, coagulation factors, immunoglobulins, hormone-binding protein, transferrin, and erythropoietin. Nephrotic

syndrome is characterized by the massive leakage of plasma proteins into the urine, evidenced by the urinalysis test showing triple-positive proteinuria. In most cases, this condition is caused by gene mutations that encode for structural or regulatory proteins of the renal filtration membrane located in the glomerular capillary walls. The Glomerular Basement Membrane (GBM) and the Diaphragmatic Slit play a crucial role in limiting the more significant flow of albumin and plasma proteins, ensuring that the protein content of the ultrafiltrate (primary urine) reaching Bowman's space is very low. There has been considerable debate about the role of the GBM in glomerular selectivity. However, recent studies have established that damage to the slit diaphragm or the GBM can cause proteinuria. This can be detected by high levels of cylindric cast and epithelium in the urinalysis test, indicating damage to the renal parenchyma. It is essential to diagnose and treat nephrotic syndrome promptly to prevent the development of severe complications that can be life-threatening. Medical professionals should be vigilant in monitoring patients with this condition for signs of complications and provide appropriate treatment to manage their symptoms effectively.[3,5,6]

Nephrotic syndrome is a condition that arises when there is an excessive amount of protein in the urine, known as proteinuria, leading to a decrease in the levels of albumin in the blood, a condition known as hypoalbuminemia. This decrease in albumin levels, in turn, reduces the pressure of fluids inside the blood vessels, resulting in fluid seeping into the tissues, leading to edema. Hypoalbuminemia can trigger the production of lipoproteins and reduce fat breakdown, leading to the buildup of cholesterol in the blood. Additionally, the liver cells are stimulated to produce both albumin and lipoproteins. Due to the decreased activity of lipoprotein lipase, the levels of fatty acids in the blood increase, leading to hyperlipidemia. The treatment of nephrotic syndrome involves a combination of non-pharmacological and pharmacological therapies, depending on the underlying cause. Non-pharmacological therapies include dietary modifications, low-salt diet, and fluid restriction. Pharmacological therapies may include corticosteroids, diuretics, and angiotensin-converting enzyme (ACE) inhibitors. In some cases, antibiotic therapy may also be necessary to prevent infections. The prognosis for nephrotic syndrome depends on the underlying cause and can be improved by early diagnosis and adequate management, including nutritional intake, protein supplementation, kidney transplantation, and dialysis. Regular monitoring of blood pressure, lipid levels, and kidney function is essential for optimal management of this condition.[4,7–10]

Conclusion

A 6-month-old male infant has been diagnosed with congenital nephrotic syndrome based on medical history, physical examination, and supportive testing. This syndrome is primarily characterized by proteinuria, hypoalbuminemia, hyperlipidemia, and edema.

Conflict of interest

Nothing to declare

Fundig Sources

Nothing to declare

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CASE REPORT **Open Access**

Rare Case of Primary Effusion Lymphoma mimicking Pulmonary Tuberculosis

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ABSTRACT

Primary effusion lymphoma (PEL), a relatively uncommon variant of large B-cell non-Hodgkin lymphoma (NHL), frequently develops in individuals with compromised immune systems, particularly in the later stages, and is characterized by the accumulation of fluid in body cavities without an observable tumour mass. We describe the situation of a 61-year-old male who presented at the emergency department with symptoms including dyspnea on exertion, a persistent low-grade fever, night sweats, and a continuous dry cough for three days. Following the initial diagnosis process, which pointed towards pulmonary tuberculosis, he was immediately started on a regimen of empirical anti-tubercular treatment (ATT). A general examination revealed a decreased oxygen saturation, tachypnea, and a bulging tenderness of the lymph node on the neck. Chest computerized tomography (CT) scan indicated pericardial and pleural effusion with mediastinal dilatation, suspected thymoma or lymphoma. The patient underwent a cardiocentesis needle aspiration, but the histological analysis did not reveal specific characteristics. Subsequently, a surgical biopsy was performed on a lymph node in the left supraclavicular area. A classical hodgkin lymphoma nodular sclerosis type was found in the histopathology examination. Immunohistochemistry detected the tumour's cellular markers (i.e., CD30). Chemotherapy treatment for six cycles resulted in an excellent outcome. In conclusion, the contribution of radiologists is essential in diagnosing PEL, as they are responsible for spotting effusions within body cavities and confirming the absence of singular masses or nodules in the pleura, which helps in significantly narrowing the differential diagnosis possibilities.

Keywords : Lung tuberculosis, lymphoma, primary effusion

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Introduction

Primary effusion lymphoma (PEL) is an uncommon type of large B-cell non-Hodgkin lymphoma (NHL) that predominantly affects middle-aged males, particularly those who are immunosuppressed or HIV-positive. It typically occurs in the advanced stages of the disease and is characterized by fluid accumulation in body cavities without a discernible tumour mass.[1] This type of cancer contributes to about 4% of all NHL cases related to HIV. Around 80% of individuals diagnosed with PEL are known to have HIV, with the majority being males aged approximately 44-45 years. In approximately 80% of PEL cases, there is also a concurrent infection with Epstein-Barr Virus (EBV). It's important to note that EBV might not be present in older patients living in areas where Human Herpesvirus 8 (HHV8) is highly prevalent.[2,3] However, primary effusion lymphoma may also occur in immunocompetent patients infected with either human herpes virus type 8 or Epstein-Barr virus.[4] This condition presents with fluid accumulation in body cavities, resulting in constitutional symptoms such as fever, weight loss, and manifestations related to external pressure, such as difficulty breathing or abdominal pain.[1,4] The diagnosis of PEL presents challenges and requires a multidisciplinary approach involving radiology, pathology, clinical presentation, and epidemiology. Radiologists are essential in verifying the existence of fluid accumulations within body cavities and excluding lymph node enlargement, organ swelling, or any other masses beyond the body cavities to confirm the diagnosis.[5,6] Sophisticated imaging tools such as diffusion-weighted magnetic resonance imaging (DW-MRI) and chest computed tomography (CT) scans are fundamental for accurate diagnosis. They help distinguish between lymphoma subtypes and monitor treatment response effectively.[7,8] In this report, we present the radiological findings of PEL, which were discovered incidentally and appeared similar to those seen in patients with pulmonary tuberculosis.

Case

A 61-year-old man presented at the emergency room with symptoms of dyspnea upon exertion, mild fever, night sweats, and a dry cough persisting for three days. Empirical anti-tubercular treatment (ATT) was administered, suspecting pulmonary tuberculosis, but acid-fast staining and gen X-pert results were negative. A chest X-ray showed left pleural effusion and substantial mediastinal enlargement (Figure 1). A general examination revealed a decreased oxygen saturation and tachypnoea. On physical examination, a bulging lymph node on the neck showed tenderness also.

A second chest X-ray was performed and showed cardiomegaly, suspected pericardial effusion. Then, we took a multiple slice CT (MSCT) scan of the chest, which showed pericardial effusion, pleural effusion, and mediastinal dilatation, suspected thymoma or lymphoma (Figure 2). No solid mass was found in the intrapleural or intrapulmonary space. Chest MSCT scan with contrast wasn't performed because the patient was allergic to the contrast. Cardiac needle aspiration was conducted, but the histological findings were non-specific, showing signs of chronic inflammation without a distinct pattern. The patient underwent a surgical biopsy of a left supra-clavicular lymph node. A classical hodgkin lymphoma nodular sclerosis type was found in the histopathology examination. Immunohistochemistry successfully identified cellular markers associated with the tumour, specifically CD30. After chemotherapy treatment (cyclophosphamide, doxorubicin, vincristine, and prednisone) for six cycles, we do a follow-up with the patient with a chest X-ray, and the result is excellent (Figure 3).

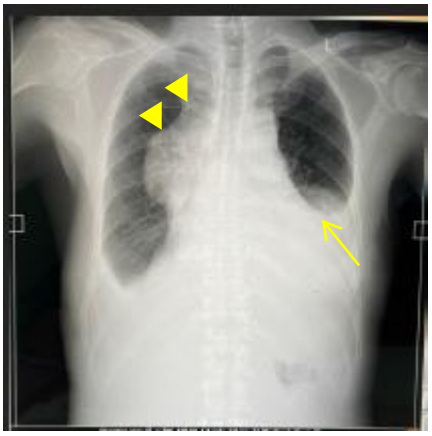

Figure 1. Initial chest radiography of the patient showed pleural effusion (arrow) and enlargement mediastinal (arrow head).

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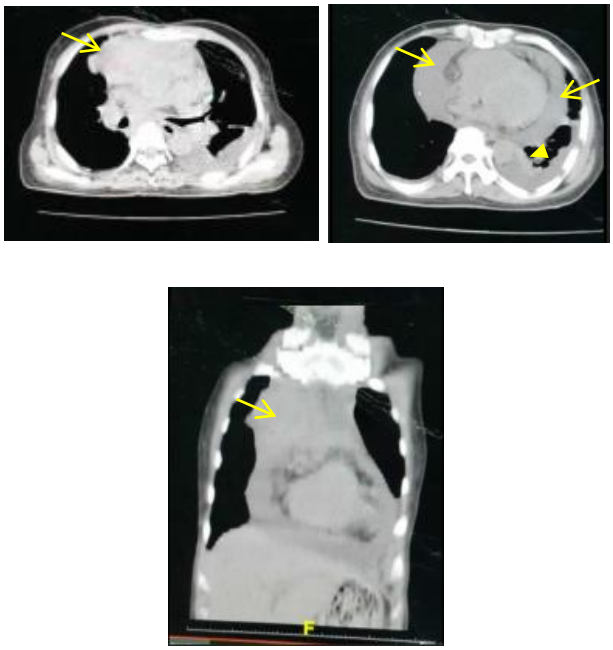

Figure 2. Non contrast chest CT-scan of the patient. A. Mediastinal mass on transversal section (arrow). B. Pericardial effusion (arrow) and pleural effusion (arrow head) on transversal section. C. Mediastinal mass on sagittal section (arrow).

Figure 3. Chest radiography of the patient following chemotherapy showed excellent improvement

Discussion

Primary effusion lymphoma is a scarce condition, comprising 4% of NHL cases in individuals with human immunodeficiency virus (HIV) and appearing in just 0.1% to 1% of all lymphomas in HIV patients residing in regions where human herpes virus type 8 is not widespread. Primary effusion lymphoma is a rare condition that often exhibits radiological images resembling those found in cases of pulmonary tuberculosis during examinations.[1,9]

Despite its infrequency, radiologists need to consider the possibility of PEL as a potential diagnosis when encountering recurring cavity effusions during or after treatment with ATT. The primary manifestation observed in untreated NHL patients often involves lymphadenopathy in the mediastinal/hilar region and the occurrence of pleural effusion.[10] After the administration of chemotherapy, radiological control was carried out, and the mass on mediastinum and effusion on pericardial and pleural space was diminished.

Conclusion

Radiologists are crucial in diagnosing PEL, as they identify fluid accumulation in body cavities and rule out the presence of solitary masses, pleural nodules, or other abnormalities, thus assisting in narrowing down potential diagnoses.

Conflict of interest

Nothing to declare

Fundig Sources

Nothing to declare

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REVIEW ARTICLE **Open Access**

Deep Brain Stimulation for Alzheimer's Disease: A Review of a Potential Treatment in Neurosurgery

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ABSTRACT

Background: Alzheimer's disease (AD) is still a disease with abundant enigma. Moreover, the prevalence of AD increases every year by about 10 million new cases. This disease is well known for its degenerative feature with age being the most influencing factor. Pathophysiologically, the deposition of beta-amyloid and tau proteins is the culprit for disrupting the neural connections in the brains of AD patients. Some studies have stated that drug medications are not effective in treating AD patients.
Content: Currently, there is no drug to cure the disease. In conditions in which drugs fail to take effect, there is a therapy called deep brain stimulation (DBS), which allows the brain to be stimulated electrically using electrodes that are implanted into certain brain areas as targets. The fornix and nucleus basalis of Meynert (NBM) are commonly chosen as targets in DBS in AD patients. This intervention is performed surgically by the neurosurgeon. Several potential mechanisms of this treatment include controlling connections among neurons, decreasing beta-amyloid and tau protein levels, and inhibiting the inflammation process in the brain.
Conclusion: DBS can improve AD patients, both clinically and molecularly. Despite the promising effects of DBS, this treatment has limitations, so it cannot be applied to every patient with AD.

Key words: Alzheimer's disease, cognitive impairment, deep brain stimulation, neurosurgery, neurofunctional

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Introduction

Globally, the prevalence of Alzheimer's disease is rising quickly. It is currently estimated about 46.8 or 50 million people diagnosed with dementia in the world, while in the Asia Pacific the prevalence reaches 20.9 million. The World Health Organization (WHO) also predicted that there are approximately ten million new cases annually.[1] As of 2016, there were about 1.2 million dementia sufferers in Indonesia; by 2030, that number is expected to rise to 2 million, and by 2050, it will reach 4 million.[2]

Dementia has several types based on etiology and pathophysiology of the disease. Alzheimer's disease (AD) is the most common type of dementia.[3] AD occurs due to the buildup of abnormal proteins that disturb the brain and nerve cells function. The proteins which contribute to AD development are β-amyloid and tau proteins. In the long term, various functions, such as controlling thoughts, memory and language, will decrease.[4]

Until now, the disease known as Alzheimer's cannot be cured. However, several medications can reduce the worsening of symptoms experienced by patients with AD[3]. There are only a few AD patients who obtain the benefit of short-term treatment effects of AD drugs. Research on non-drug treatments has developed as a result of the limits of medication therapy effect and the severity of AD.[5] One of the promising treatment options for AD is deep brain stimulation (DBS). DBS is a treatment in neurosurgery, especially neurofunctional division, which modulates activity on neurons in the brain by placing internal generators as stimulators to electrodes in distinct target parts.[6] Some studies reported that DBS treatment improved the cognitive function, spatial memory and recognition. This treatment also could slow down the disease progression

This paper will discuss the potential treatment for AD in neurosurgery using deep brain stimulation (DBS). We will conclude the effectiveness and the efficacy of DBS for managing AD.

Etiology and Pathophysiology

The etiology of AD is not clearly understood. Many theories have been described about disease progression of AD. It is well known that AD occurs when plaques of abnormal proteins accumulate and tangles of neurofibrillary form in the brain. There are two proteins which are familiar in contributing to AD progression, they are beta-amyloid and tau proteins.[7] The beta-amyloid protein originated from the amyloid precursor protein (APP), a transmembrane protein. Proteases such as alpha, beta, and gamma-secretases cleave the beta-

amyloid peptide from the amyloid precursor protein (APP). When alpha- or beta-secretase is functioning normally, APP will be broken down, and the resulting pieces won't damage neurons. Nevertheless, 42 amino acid peptides known as beta-amyloid 42 are produced by gamma-secretase and beta-secretase cleavages. An elevation in beta-amyloid 42 causes amyloid aggregation, which damages brain neurons.[6] Beta-amyloid 42 induces the accumulation of aggregated fibrillar amyloid protein over normal APP degradation. The APP gene is located on chromosome 21, which is linked to familial Alzheimer's disease. Amyloid is deposited in the grey matter, cerebral arteries, and the area around the meninges.[7]

Tau proteins have a role in stabilizing microtubules. Tau protein binds the microtubules together, which are located along neuronal axons and its function in intracellular transport.[7] In the pathologic condition of AD, abnormal alteration of beta-amyloid causes tau hyperphosphorylation that leads to separation of tau from microtubules, then accumulation of tau aggregates happen. This tau aggregates formation which generates twisted coupled helical filaments are called neurofibrillary tangles. Due to this condition, the synaptic communication between neurons is blocked by neurofibrillary tangles.[8]

Other theories regarding AD have been hypothesized, such as granulovacuolar degeneration, hirano bodies, synaptic loss, genetic mutation, and inflammatory responses.[7,8] Granulovacuolar degeneration is the accumulation of membrane-bound vacuolar structures with a dense core in the brain. The Granulovacuolar increases in the hippocampus of AD patients, which indicates a significant correlation with tauopathy condition.[9] Hirano bodies are described as refractile eosinophilic rod-like structures which run in neuronal dendrites. Their structures are rich in actin and actin-associated proteins. Although this feature is highlighted in AD, its role in AD pathophysiology is still poorly recognized.[8] Synaptic loss is observed at the early progression of AD. The characteristics of synaptic loss in AD are disorder in axonal transport, destruction of mitochondria, and oxidative stress. Neurogranin, visinin-like protein-1, and synaptotagmin-1 are proteins which can be used as biomarkers of synaptic loss.[10] Some genes which are linked to AD are AAP gene on chromosome 21, Presenilin1 (PSEN1) on chromosome 14, Presenilin 2 (PSEN2) on chromosome 1 and apolipoprotein E (ApoE) on chromosome 19.[7,10] Inflammatory response in the brain, especially due to microglial cells, contributes to the AD process. When these cells are activated in AD patients, their numbers increase but they fail to clear pathologic debris such as neurofibrillary tangles and beta-amyloid deposition.[10] On the other hand, these microglial cells might cause neuronal damage.[8]

Despite the condition that pathophysiology of AD remains unclear, there are several risk factors that contribute to AD progression. Unmodifiable and modifiable risk variables make up the main category of AD risk factors. Age, gender, and genetic characteristics are the unchangeable risk factors. Genetic factors have been described in previous paragraphs. While age is the most important risk factor for AD development. Individuals over the age of 65 are twice as likely to develop Alzheimer's disease.[11] It is stated that women are at greater risk than men, but the understanding of this condition is imprecise. Because women typically live longer than men do, they are more likely to develop AD dementia over their lifetime, just like they are more likely to get other aging-related disorders.[11] Several acquired risk factors of AD are cerebrovascular disease, hypertension, stroke, diabetes melitus, obesity, dyslipidemia, history of psychiatric disease (depression and insomnia), smoking, lack of exercise, and vitamin D deficiency.[12]

Diagnosis

Alzheimer's Disease (AD) is a pathologic condition which can be cured but It is important to diagnose it early to improve the symptoms of patients with AD. History taking and clinical examination are crucial examinations to make prompt diagnosis of AD. Some red flag conditions to suspect an individual developing AD are gradual memory loss, behavior changes, difficulty of speech and nonsense decision-making.[13] A physician also should look for risk factors that precipitate the AD in patients. These assessments are aimed at ruling out other disorders instead of AD. Mini mental state examination (MMSE) is a tool that can help in screening patients with AD, because MMSE can determine that an individual has any cognitive disorder.[10]

Definitive diagnosis of AD is difficult to establish. National Institute of Aging and Alzheimer's Association (NIA-AA) make some recommended tests which can be used in diagnosing AD. In the 2018 NIA-AA revised the diagnostic criteria, which identified imaging and CSF biomarkers as valid diagnostic tools (Table 1).[14] The US Food and Drug Administration (FDA) recommended staging approach for the Alzheimer's spectrum and the clinical phases correspond. The clinical stage, the assessment tools, and the ATN categorization are evaluated. There are some laboratory and radiology examinations can be utilized to diagnose Alzheimer's disease. Computed Tomography (CT) scan is used to rule out other underlying diseases, such as vascular dementia, stroke or fahr's disease. Neurofibrillary tangles and the level of tau protein and beta-amyloid in AD patients can be assessed using a PET scan or a cerebrospinal fluid (CSF) test. These instruments revealed

that the symptoms weren't derived from concomitant illnesses, but were mainly associated with AD pathophysiological pathways. However, because of the lack of evidence linking biomarker concentrations with AD pathology, the limited availability of the tools, and the insufficient standardization of the analytical results, biomarkers could only be used as supportive diagnostic tools in clinical research and could not be implemented in clinical diagnostic settings.[15]

Table 1. The diagnostic criteria of AD based on NIA-AA.[14]

Clinical phase	Assessment			ATN Classification		
	Cognitive deficit	Functional deficit	Behavioural deficit	A	T	N
Normal cognitive without decline indication	PACC; APCC	Absence	Absence	+	-	-
Normal Cognitive with decline indication	PACC; APCC	Absence	Absence	+	+	- / +
Prodromal AD	CDR-sb; ADCOMS; iADRS; NTB	ADCS-ADL (MCI version)	MBI/NPI	+	+	+
Mild AD dementia	ADAS-cog; NTB; CDR-sb	ADCS-ADL	NPI	+	+	+
Moderate AD dementia	ADAS-cog; NTB; CDR-sb	ADCS-ADL	NPI	+	+	+
Severe AD dementia	SIB; CDR-sb	ADCS-ADL (severe version)	NPI	+	+	+

Medication Treatments

There are currently only symptomatic therapies for AD, which have no effect on the disease's progression. Acetylcholine or glutamate are the neurotransmitters that are modulated by all medications to treat AD that have been approved by the FDA. The usual medical treatment for AD includes cholinesterase inhibitors (ChEIs) and a partial N-methyl-D-aspartate (NMDA) antagonist[16]. Furthermore, several drugs which target amyloid have been approved, such as monoclonal antibodies (e.g., aducanumab, bapineuzumab, lecanemab). However, tau-targeted drugs are still in clinical trials.[17]

Some studies about AD progression suggested that a cholinergic system is impaired in AD whereas it modulates neuronal information in the hippocampus and neocortex.[18] Those

studies also reported that clinical signs and symptoms of AD are caused by loss of cholinergic innervation to the cerebral cortex. Cholinesterase inhibitors (ChEIs) block acetylcholinesterase (AChE) at the synapse (specific cholinesterase) to improve cholinergic paucity. Several ChEIs drugs which are currently approved are donepezil, rivastigmine and galantamine.[16] Although AD cannot be cured by ChEIs drugs, these drugs are supposed to restrict neurodegeneration in patients.[18]

N-methyl-D-aspartate (NMDA) antagonist drugs act by inhibiting NMDA receptors uncompetitively in the brain. Some benefits of NMDA antagonist drugs are neuroprotective effects by blocking the deprivation of neurons and restoring the function of injured neurons in the brain.[16] Memantine is one of NMDA antagonist drugs which has been approved by FDA to treat AD patients since 2003. A study conducted by McShane *et al*. stated that memantine had a small clinical benefit in patients with moderate-to-severe AD, nonetheless taking ChEIs drugs or not. On the other hand, memantine was not effective in treating mild AD patients.[19]

Monoclonal antibodies have been developed to target beta amyloid and bind to beta-amyloid aggregates to lessen the plaques associated with AD. Aducanumab is one of immunoglobulin G monoclonal antibodies that targets beta amyloid and has promising results in improving AD patients at pre-clinical and mild stage.[16] Although bapineuzumab was reported to decrease amyloid aggregation in Apoe4 carriers, this drug does not change either cognitive or functional outcomes. A humanized immunoglobulin gamma 1 (IgG1) monoclonal antibody, lecanemab also functions by preventing beta amyloid aggregation from forming. Lecanemab should be considered for the treatment of individuals with moderate AD.[20]

Deep Brain Stimulation

Deep Brain Stimulation (DBS) is a surgical procedure that stimulates particular brain regions by sending electrical impulses through electrodes. Some diseases, such as Parkinson's disease, dystonia, and depression, which are resistant to drugs, can be treated by DBS.[21] The difference in DBS treatment among diseases depends on the target areas to be electrically stimulated. In AD patients, areas that are used to be triggered are the fornix (hypothalamus) and the nucleus basalis of meynert (NBM).[22] The vagal nerve can also be chosen to be the stimulation area, but this nerve is outside the brain area and not specific, thus vagal nerve stimulation (VNS) is not included as DBS. The application of VNS modality is wide, such as depression, epilepsy, and others.[23]

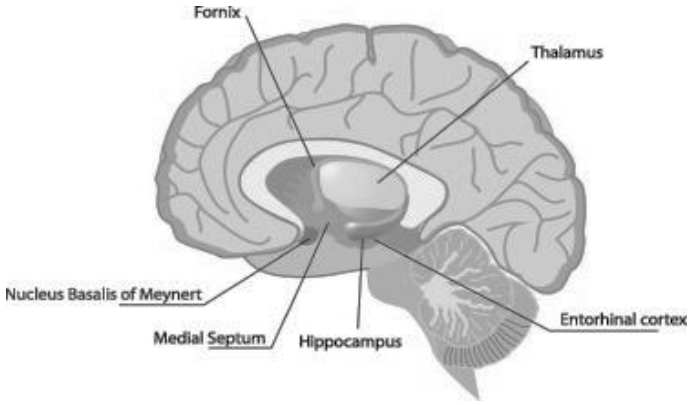

Figure 1. Some brain areas targeted in deep brain stimulation.[28]

Table 2. The target areas of DBS for some conditions.[22]

Condition	Target Areas	Advantages/Mechanism	Disadvantages/ Adverse Effects
Parkinson's disease	Subthalamic nucleus Globus pallidus internus	Improve motor symptom Ameliorate tremor Reduce medication	Depression Personality change Fatigue
Epilepsy	Anterior Nucleus of the Thalamus Hippocampus Medial septum	seizure frequency reduction longer seizure-free interval improved quality of life	Paresthesia in the limb or face Disturbance in speech or vision Balance problems
Obsessive-compulsive disorder	Anterior limb of Internal Capsule Nucleus Accumbens Ventral caudate/striatum	Decrease obsessive symptoms	Hypomania Sleep disturbances Weight gain Fatigue
Essential tremor	Ventral Intermedius Nucleus	Decrease tremor symptom	Depression Paresthesia Fatigue
Major Depressive disorder	Subcallosal cingulate Nucleus Accumbens Medial forebrain bundle	Improve depressive symptoms Improve mood of the patient Increase Serotonin and brain-derived neurotrophic factor	Paresthesia Increase dizziness frequency Uncontrollable jerking movements of arms or legs
Alzheimer's Disease	NBM Fornix Entorhinal cortex	Improve cognitive function Increase memory Slow the disease progression	Palpitations Paresthesia Fatigue

In the brain, NBM was a former target area for stimulation in AD patients. The neocortex and hippocampal regions are innervated by the vast cholinergic projections found in NBM. The NBM cholinergic pathway has a significant decline in AD patients.[22] Acetylcholine (ACh) is an important substance for memory and cognitive function. ACh mostly originates from the NBM cholinergic pathway. As shown in the Figure 1, this area is located on the anterior lateral part of the hypothalamus and below the anterior commissure and globus pallidus.[28] Damage to the NBM can affect cholinergic transmission reduction and degenerative changes of the hippocampus. In AD, DBS in the NBM has demonstrated good effectiveness. On the evolution of AD and cognitive function, DBS in the NBM conducted in the early stages of AD may be advantageous.[24] Additionally, DBS to NBM can lower the amount of beta amyloid protein, control the gamma-aminobutyric acid (GABA), glutamate system, and cholinergic systems, enhance spatial learning and memory in AD model mice, and have neuroprotective effects.[25]

The fornix, an essential part of limbic circuits, is responsible for memory processing and transports cholinergic axons from the septal area to the hippocampus. The fornix resembles an arcuate fiber bundle that connects the mammillary bodies to the hippocampal region. Any damage to the fornix can cause memory impairment.[6] In 2008, DBS in the fornix was reported firstly to improve the memory of the patient. Due to its successful result in improving memory, DBS in the fornix began to be applied in to AD patients. A study by Sankar *et al.* showed that DBS in the fornix had a bilateral increased hippocampal volume in AD patients. This result suggests that fornix DBS may improve brain volume, while the brain condition in AD patients is atrophy.[26] Another study conducted by Lozano *et al.* found that DBS surgery and stimulation processes were safe and well tolerated in mild AD patients. The glucose metabolism of the brain is increased in AD patients who received the fornix DBS.[27] In animal studies, Fornix has the potential to stimulate the brain area electrically in AD model patients to improve memory function, decrease beta amyloid deposition in the hippocampus and cortex, inhibit microglial activation and lessen neuronal damage.[28,29] According to these findings, fornix is the potential target area for DBS treatment in AD patients.

DBS treatment requires some equipment, such as a lead with electrodes, a wire, an implantable pulse generator (IPG), a set of brain surgery instruments, and a set of chest wall implantation instruments. It is important that the hospital which performs DBS surgery also supports stereotactic procedures.[30] Using a stereotactic head frame, the head of the patient will be immobilized during surgery. DBS treatment begins with creating skin incisions at the skull to make small holes in the skull. The electrodes of the DBS treatment are implanted into

the skull, passing through the holes.[31] DBS surgery is carried out under general anesthesia or local anesthesia while the patient is awake. In awake brain surgery, an anesthesia is administered to numb the scalp and the brain does not need to be given an anesthesia since it lacks receptors of pain.[32] Small electrodes which have been implanted to certain brain areas then are connected to the wire which runs superficially to the skin towards the IPG. During surgery, brain function is monitored to ensure the position of electrodes and the function of stimulation.[31] For the IPG placement under the skin, the surgery requires general anesthesia. The chest wall surgery is performed to implant the device of DBS treatment under the skin, usually near the clavicle. There is an exclusive remote control that connects to the IPG.[30]

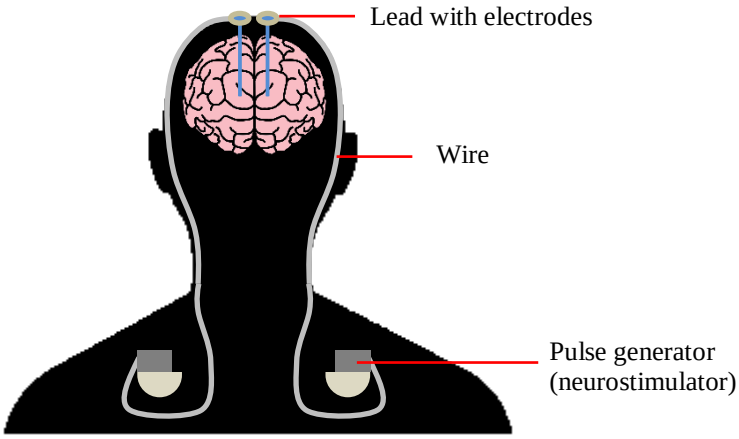

Figure 2. Illustration of DBS treatment in Alzheimer's disease.

Practically, electrical stimulation of DBS is regulated by its frequency and duration. There are two types of frequency stimulation: high-frequency stimulation (HFS) and low-frequency stimulation (LFS). HFS has a frequency range of 25 to 1000 Hz, and it is commonly used for mental illness, movement disorders, and cognitive impairment.[6] While LFS has no effect on AD patients.[33] Huang *et al.* carried out in vivo research to measure the optimal frequency for DBS with NBS as a target area. In mice, cognitive function improved significantly (parameters used were learning period and occupation time) in mice with HFS of DBS (50 Hz, 100 Hz, and 130 Hz). It can be concluded that a higher frequency is better than a lower frequency for DBS in AD patients. However, the optimal DBS frequency remains unclear.[28] The duration of DBS in patients is also related to the slowing progression of the disease. Several studies about DBS treatment in animal models showed that both acute and chronic stimulation can lead to long-term brain remodeling.[34] For daily duration, some studies suggested that one hour, seven hours, and 24 hours of duration already affected the improvement of spatial memory and recognition. However, it is recommended to use DBS in

the long term to allow long-term alteration in brain function.[35] Based on the duration of the day, DBS for 14, 21, and 28 days has been proven to improve the memory of animal models and decrease beta-amyloid levels in the brain, especially in the cortex and hippocampus. On the other hand, 7 days of DBS had no good impact.[33]

Although the mechanism of DBS as a treatment in AD is unknown, it is generally accepted that DBS acts by stimulating or inhibiting the neuronal cell bodies that are close to the electrodes and the axons that pass nearby high-frequency stimulation has the potential to produce a reversible functional lesion by reducing local activity. On the other hand, nearby neurons seem to be generally activated by low-frequency stimulation.[21] There are some theories of the potential mechanisms of DBS as an AD treatment, such as controlling related neural connections, inducing nerve oscillation, decreasing beta-amyloid levels, decreasing tau levels, reducing inflammation in the brain, modulating the cholinergic system, and inducing nerve growth factor (NGF) synthesis.[21]

DBS treatment cannot be applied to all AD patients. Research by Lorenzo *et al.* revealed that DBS treatment in AD patients may benefit patients aged 65 years or older, while patients aged under 65 years showed no benefit effect instead of worsening condition.[27] The risks and complications that can develop in patients with DBS treatment include infection, malposition of IPG or electrodes, disconnection of wire, and intracerebral hemorrhage (ICH). A study by Jung *et al.* showed several complications after DBS treatment, with infection being the most common complication, accounting for about 2.8% of all 416 subjects. ICH and hardware-related complications were the most common complications after infection, respectively.[36] Therefore, in treating AD patients with DBS, the neurosurgeons and neurologists should choose more selectively the candidate of the patient who will undergo DBS treatment in dealing with AD.

Conclusion

Alzheimer's disease (AD) is a degenerative disorder that is currently claimed to be unable to be cured. AD occurs usually when beta-amyloid proteins are accumulated and tau proteins are deposited in the brain, which causes some brain functions to not work properly. Several drugs are prescribed to improve quality of life in cases of cognitive and memory problems, but they are not effective in slowing the disease progression. A procedure in neurosurgery, deep brain stimulation (DBS), has potential advantages for treating AD, whereas medication is not effective as an AD treatment. DBS for AD has some specified target brain areas; fornix and NBM are the most frequently selected areas because DBS in

these areas is proven to improve the quality of AD patients both molecularly and clinically.

List of Abbreviations

A: amyloid; Ach: Acetylcholine; AD: Alzheimer's Disease; ADAS-cog: Alzheimer's Disease Assessment Scale – cognitive subscale; ADCOMS: AD Composite Score; ADCS-ADL (MCI): Alzheimer's Disease Cooperative Study – Activities of Daily Living scale (mild cognitive impairment version); APCC: Alzheimer Prevention Initiative Cognitive Composite; APP: amyloid precursor protein; ATN: Amyloid, Tau and Neurodegeneration; CDR-sb: Clinical Dementia Rating- Sum of Boxes; ChEIs: cholinesterase inhibitors; CSF: Cerebrospinal fluid; CT: Computed Tomography; DBS: Deep Brain Stimulation; FDA: U.S. Food and Drug Administration; GABA: gamma-aminobutyric acid; HFS: high-frequency stimulation; iADRS: Integrated AD Rating Scale; ICH: intracerebral hemorrhage; IPG: implantable pulse generator; LFS: Low-frequency stimulation; MBI: Minimal Behavioral Impairment scale; MMSE: Mini mental state examination; N: neurodegeneration; NBM: nucleus basalis of meynert; NFG: NGF: nerve growth factor; NIA-AA: National Institute of Aging and Alzheimer's Association; NMDA: N-methyl-D-aspartate; NPI: Neuropsychiatric Inventory; NTB: Neuropsychological Test Battery; PACC: Preclinical Alzheimer Cognitive Composite; PET: Positron Emission Tomography; PSEN1: Presenilin1; PSEN2: Presenilin2; SIB: severe impairment battery; T: tau; VNS: vagal nerve stimulation; WHO: World Health Organization

Conflict of Interest

All authors declare that there is no conflict of interest in this paper.

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ORIGINAL ARTICLE **Open Access**

The Influence of Modified Anatomical Jendral Playing Cards in Improving Medical Student Learning Outcomes

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ABSTRACT

Introduction: Human anatomy is a basic and challenging medical science studying the normal structure of the human body and its relationship with other body structures. However, the current anatomy learning methods must continue to be developed to make them better. This research aims to see the effect of modified anatomy Jendral playing cards on the results of the anatomical response of the musculoskeletal system in medical students.

Method: This research was carried out at the Faculty of Medicine, Universitas Negeri Gorontalo, on 31 first-year pre-clinical medical students consisting of 7 men and 24 women with an average age of 18 years. The research design used is *a pre-experiment method* with *one group pretest-posttest design* where respondents will be given an intervention by playing Modified Jenderal Anatomy Playing Cards. Analysis of this research data used the Wilcoxon Test.

Results: There was an increase in quiz results from 8.00 ± 12.00 (median ±*interquartile range*) to 36.00 ± 24.00 (median ±*interquartile range*), as well as the p-*value* of 0.000 (p-*value* ≤0.05).

Conclusion: Playing modified anatomical jendral playing cards influences the results of medical students' Anatomy of Musculoskeletal System Practical Response Assessment. Medical teachers will use the present learning media innovation in activities reviewing anatomy practicum and using pictures Cadaver, which will be assessed to improve medical students' learning outcomes.

Key words: Anatomy assessment results, anatomy cards, learning media, medical students

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Introduction

Human anatomy is a basic medical science that studies the normal structure of the human body and its relationships with other body structures.[1] Anatomy is also the basis for studying the physiology of the human body as well as abnormal changes in the human body or what is called pathophysiology, which can trigger disease.[2] Without understanding anatomy and physiology, students cannot carry out a good and correct physical examination to reach a clinical diagnosis of the patient. Research conducted at the Faculty of Medicine, Islamic University of Indonesia found that 81 out of 85 students with a percentage of 95.29% realized that remembering the anatomical structure of organs related to certain diseases, strengthens understanding of related diseases.[3]

Anatomy is a basic science which is considered difficult to learn and memorize the terms. Research carried out in *Florida Gulf Coast University* shows that out of a total of 1328 students who took anatomy and physiology I courses, only 982 students were able to take all four of the four exams in this course. Meanwhile, in the Anatomy and Physiology II courses, only 586 out of 643 students were able to take all the exams in these courses.[4] Previous research data from the results of the anatomy practicum exam at the Faculty of Medicine, University of Lampung, was that only 38 people (25.3%) out of 112 people (74.7%) of respondents were declared to have passed the anatomy practicum exam.[5] Another research conducted at the Indonesian Christian University with a sample of 110 students in semesters 1, 2 and 3 who were interested in studying anatomy, after comparing the student learning outcomes obtained from studying anatomy, 50% of students did not meet graduation standards.[6]

Applying *games* in the teaching and learning process can make it easier for students to understand learning concepts. This is in line with the challenges of medical education in the 5.0 era, which requires innovation in learning by utilizing the latest technological developments.[7,8] The research results show that the use *game* can improve students' logical abilities and understanding of learning material. Additionally, use *game* in learning can also increase students' motivation and interest in learning.[9] Research conducted on medical students in *University of Otago, New Zealand* (n=300); *Manipal University, India* (n=72); *Khon Kaen University, Thailand*(n=274), by providing learning media in the form of *Anatomy Board Game* Showing feedback from players, it was found that this game was fun (95%), interested in this game (81%) and found it helpful in learning anatomy (97%).[10]

From the results of initial observations on two first year students of the Faculty of Medicine, Gorontalo State University (FK UNG), the student explained that anatomy is a

science that requires a lot of memorization, especially on the topic of Osteology and there is a lot of material that must be memorized while they are still in the adjustment stage medical. According to the student, the time given to study anatomy is not commensurate with the teaching material that students must study and lecture learning still seems less enjoyable because it is focused on *power point* lecturer. Based on the description above, researchers are interested in making a General Anatomy Modification game*Playing Cards* to make it easier for students to study anatomical material on musculoskeletal topics. Therefore, researchers conducted research to see the effect of playing General's Anatomy Modification*Playing Cards* Regarding the results of the anatomical response of the musculoskeletal system in medical students.

Methods

This research was carried out in August-September 2023 at FK UNG. This type of research is a *pre-experiment method* with *one group pretest-posttest design*. The study's population comprised students from the 2023 FK UNG academic class, totalling 69 individuals. A minimum sample size was determined based on the guidelines proposed by Roscoe (1975), which suggest that an adequate sample size should be at most 30 but not surpass 500 participants for empirical research.[11] In the study, the researchers initially recruited a sample size of 32 participants. However, one participant could not participate in the study during the research.

The independent variable in this research is playing Generals Anatomy Modification *Playing Cards* and the dependent variable in this study is the result of the anatomical response of the musculoskeletal system. Generals Anatomy Modification Playing Cards contain anatomical pictures and questions on the cards (Figure 1). The game was played after *pretest* given and before it was carried out *posttest*. The efficacy of utilizing a general anatomy game as a pedagogical tool in enhancing students' understanding of the musculoskeletal system was evaluated by comparing test scores before and after the intervention. The assessment comprised 25 questions, each associated with an anatomical image. Correct responses were awarded four points, while incorrect answers received zero points (Figure 2).

The collected data was subsequently subjected to both univariate and bivariate statistical analyses using the statistical package for social sciences (SPSS) software (IBM, USA). For the univariate analysis, the central tendency and dispersion of the data were characterized by the median and the interquartile range (IQR), respectively. In the case of

bivariate analysis, the Wilcoxon signed-rank test was employed to assess the statistical significance of differences between paired observations.

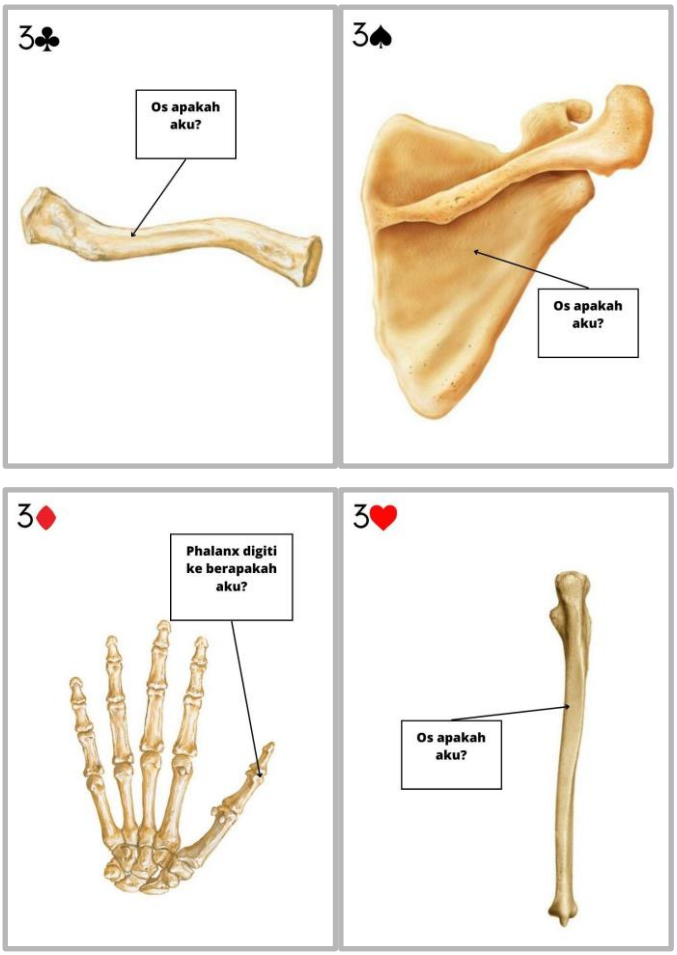

Figure 1. Design of modified anatomy playing cards

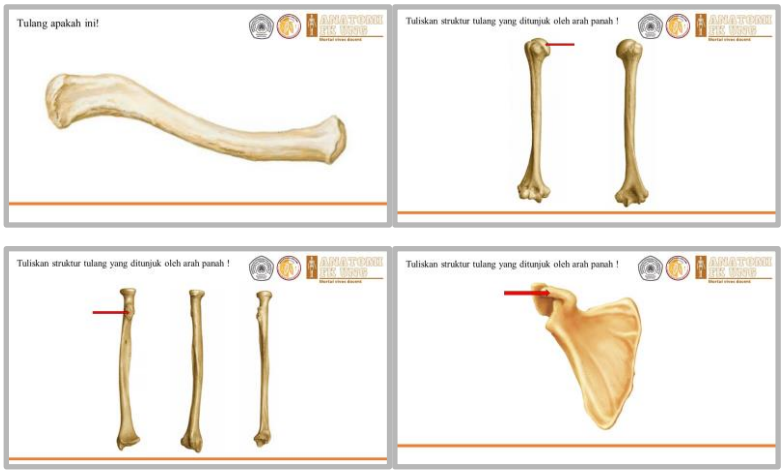

Figure 2. Design of pretest and posttest questions

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Results

In Table 1, out of a total of 31 respondents, there were 7 (22.58%) male respondents and 24 (74.40%) female respondents. And out of a total of 31 respondents, there were 2 people (6.45%) aged 17 years, 20 people (64.52%) aged 18 years, 7 people (22.58%) aged 19 years and 2 people (6.45%) respondents were 20 years old.

Table 1. Distribution of respondents by gender and age

Characteristics	Frequency	Percentage(%)
Gender		
Male	7	22.58
Female	24	74.40
Age		
17	2	6.45
18	20	64.52
19	7	22.58
20	2	6.45

In Table 2, the data analysis reveals a significant improvement from the pretest to the posttest results. Specifically, the median score escalates from 8.00 in the pretest to 36.00 in the posttest. Additionally, the interquartile range (IQR), which measures the spread of the middle 50% of the data, widened from 12.00 in the pretest to 24.00 in the posttest, indicating a more excellent dispersion in the posttest scores. The Wilcoxon signed-rank test, a non-parametric statistical test used to compare paired samples, yielded a significance (sig.) value of 0.000. This indicates a statistically significant difference between the pretest and posttest results, underscoring the impact of the intervention or treatment administered between the two testing periods.

Table 2. Comparison between pretest and post-test score following the intervention

	Median	IQR	p-value
Pretest	8.00	12.00	0.000*
Posttest	36.00	24.00	

*Wilcoxon test

Discussion

Based on data analysis of the response results before being presented by General Anatomy Modifications*Playing Cards* The median value was 8.00 and the IQR value was 12.00. This could be because human anatomy is a branch of basic science that is relatively new to students, especially the language used is Latin. Research conducted by Chairad, 2018, analyzed the difficulties of learning anatomy among students. The results generally showed

that students had many problems in using the language of human anatomy.[12] This research was carried out when students had not been exposed to anatomical material at all with the aim of minimizing bias in the research. However, due to the density of students' lecture schedules, research was carried out while students were still undergoing biomedical block 1 on biochemistry and histology topics, so students tended to focus on the walking block and the difficulties and obstacles in participating in research. According to Jeff Comer, a psychologist from *California Southern University* explains that humans cannot do work independently *multitasking*, but rather formed to do work collectively *mono-tasking*. This is in accordance with research conducted on law students in *Germane University* to see that *multitasking* has high negative effects as well as low positive effects compared to *monotasking* with research results showing that the nature *multitasking* tend to have high negative effects and low positive effects.[13] Apart from that, students still have difficulty studying anatomy because they have not received the right method for learning, such as playing Modified Generals Anatomy *Playing Cards*. The best method for studying anatomy is cadaver prosection, but prosection *Cadaver* many have disadvantages, including a lot of time required, limitations *Cadaver*, as well as strict ethical issues in procurement procedures *Cadaver*.[14]

The median score following exposure to the General Anatomy Modification game Playing *Cards* was 36.00 (IQR 24.00). Results *posttest* students tend to increase. If we look at each game group, which consists of 8 groups and each group consists of 4 players, except for 1 group which only consists of 3 players, there is an increase in results for all players except 1 person who gets the same results.*pretest* and *posttest*. Players who get the same result between *pretest* & *posttest* is a member of a group that has a complete formation of 4 people and does not make any irregularities or skip the playing process so that the cause of the results not increasing is the respondent's internal factors. This increase in response results was caused by students having been exposed to the Modified General's Anatomy learning media *Playing Cards* in learning, with the method of learning while playing or what is called*Game Based Learning* making it easier for students to re-study and memorize human body anatomy terms. According to Winata in Sukmawati, 2022 method*Game Based Learning* can make it easier for students to understand the material presented because this method can increase student motivation, so that participants are enthusiastic about learning, besides that students feel challenged and happy because they can collaborate with friends.[15] Modified Generals Anatomy Game*Playing Cards* applies the learning method by students playing directly in groups consisting of 4 players. With this concept, students can carry out learning

methods by doing or in educational terms what is called *learning by doing* to encourage progress in student learning outcomes. John in Robani, 2021 explains that in the learning process, students or learners must feel what is being learned and do it directly in the original situation. This is in line with Hamalik's statement in Robani, 2021, explaining that it will be more effective if the learning process is directed at the process of working or carrying out certain tasks that are linear to the topic.[16] Apart from that, General Anatomy Modification*Playing Cards* It also allows students who cannot answer questions in the game to tend to remember the material they have not been able to answer. This is in line with one *human behavior* which was discovered by Bluma Zeigarnik, namely*Zeigarnik effect*. *Zeigarnik effect* states that work interruptions or tasks that have not been actively completed can replay information in our minds that causes special tension periodically so that we will continue to think about the work until it can be completed.[17]

The increase in response results among respondents was because respondents were given treatment in the form of learning media in the form of modified anatomy cards*Playing Cards.* Learning media has been proven to provide good results in the learning process, this is in accordance with research conducted by Wati and Valzon on medical students at Abdurrab University to see the effectiveness of various anatomy learning media, whether based on text, video or a combination of text and video. This research shows that learning media is effectively used in the learning process, especially text and video-based anatomy learning media.[18] Currently, game-based learning methods or what are called game-based learning methods have also been developed*Game Based Learning* (GBL). One of the studies conducted to assess the effectiveness of GBL was research conducted by Aini, 2018 on class .2%.[19] Anatomical cards were developed by Rahmasari at the Faculty of Medicine, Muhammadiyah University of Yogyakarta to see student learning outcomes before and after the active learning process using Dental Anatomy cards (KABANOGI) which provide improved results.*pretest* the *posttest* namely 66.69% to 77.12%.[20] Learn anatomy based on how to play Generals Anatomy Modification*Playing Cards* namely by practicing in groups, in other words involving players to do directly something that is currently being studied so that there is an increase in the knowledge of the respondents. Another research was conducted at Gorontalo State University to determine student perceptions of usage *digital illustrators* in histology practicum, which was applied directly by the practitioner, the result was that this method helped the histology practicum learning.[21] This is in accordance with one of Bloom's Taxonomies, namely the psychomotor aspect where respondents implement the theoretical knowledge they learn into real actualization. According to this theory,

respondents who have comprehensive theoretical knowledge are able to implement the theory well.[22]

Apart from previous research which supports that the use of learning media in the form of games can improve learning outcomes, respondents in this study also provided feedback that they felt helped in the learning process because of General Anatomy Modification.*Playing Cards* It is packaged in a simple and educational way and they feel happy playing these cards because it provides motivation to learn by encouraging them to compete with their gaming group friends. In accordance with the results that researchers got from playing Generals Anatomy Modification*Playing Cards* improve the results of the anatomical response of the musculoskeletal system of FK UNG students. Modified Generals Anatomy Game*Playing Cards* applies a learning method using card games and is played in groups, so that several aspects are influenced by the players, namely the desire to win the game, motivation to learn, and the tendency to remember easily because they learn by doing it directly.

The limitation of this research is that this research only used one group of students and did not use a control group, namely a group that was not given treatment, so the researchers did not have comparative data to see the accuracy of the results obtained.

Conclusion

There is an influence of playing General Anatomy Modification*Playing Cards* on the results of the anatomical response of the musculoskeletal system of FK UNG students. It is hoped that this learning media will be used in activities *review* anatomy practicum and using pictures *Cadaver* which will be tested to be more appropriate to the learning achievements of Medical Students.

Conflicts of Interest

Nothing to declare.

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ORIGINAL ARTICLE **Open Access**

An Overview of The Risk Factors for Patients with Inguinal Hernia at Aloei Saboe Hospital in Gorontalo

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ABSTRACT

Introduction: Hernias happen when an organ or tissue bulges through a weak point in the abdominal wall. Inguinal hernias are common and may need surgery. The present study report the overview of the risk to affect the inguinal hernia at Aloei Saboe Hospital.
Method: The research focused on patients with inguinal hernias who underwent examinations at Aloei Saboe Hospital, in Gorontalo Province from January to December 2022. The study used the total sampling technique, with a sample size of 42 individuals. It was conducted in September and October 2023 at the same hospital.
Results: The data indicates that a significant portion of patients in the range of age 56-65 years (28.6%), with a majority being male (85.7%). Additionally, the majority of patients who were not employed (19.0%) were also found to have this condition, as well as a vast majority of those with a primary diagnosis of inguinal hernia (88.1%).
Conclusion: Most patients with inguinal hernia at Aloei Saboe Hospital are males in the late elderly age group who are no longer working. The main diagnosis for most patients is inguinal hernia. The study's findings suggest that the hospital can enhance its system, particularly in archiving medical records or electronic medical forms, to serve its patients better.

Key words: Gorontalo, hernias, inguinal hernia

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Introduction

A hernia is an abnormal protrusion of a defective organ or tissue through a weak abdominal cavity.[1] Inguinal hernia is one of the most frequently encountered surgical problems, accounting for approximately 70-75% of all hernia operations.[2] This inguinal hernia most often occurs in the age range between 75 and 80 years.[3] Based on research from Merry et al., the most common inguinal hernias were between the ages of 41-65 years, namely 50 people (43.8%), as many as 27 people (23.7%) experienced inguinal hernias at the age of more than 65 years, as many as 13 people (11.4%) had inguinal hernias between the ages of 0-5 years, 10 people (8.8%) had inguinal hernias between the ages of 21-40 years, 8 people (7.0%) subjects experienced inguinal hernias between the ages of 11-20 years, and as many as 6 (5.3%) subjects experienced inguinal hernias at the ages of 11-20 years.[4] The older a person gets, the possibility of anatomical and functional decline in the body, the larger the organs, and hernias are one of the diseases that can be caused by increasing age.[4]

The incidence of inguinal hernias is more common in men, with a ratio of 8 to 10 times more at risk of experiencing inguinal hernias than women, men who have undergone a prostatectomy or who have a family history of hernias.[3] As many as two-thirds of these hernias are a type of hernia *indirect* which causes inguinal hernias to be the most common type of hernia in men and women. From data on all cases of inguinal hernia, around 90% occur in men and around 10% occur in women. More than 20 million patients undergo inguinal hernia repair surgery.[2]

Apart from the two factors above, work factors are one aspect that is often assessed in looking at the risk factors for inguinal hernias. Based on data from Regional Health Research (2018), in 2017 in Indonesia, the majority of hernia cases in Indonesia occurred in heavy workers, reaching 70.9% (7,347), and the most were in Banten at 76.2% (5,065), while the lowest number was in the Papua region, namely 59.4% (2,563). Based on research conducted by Ryan et al. Based on job distribution data, the majority of inguinal hernia sufferers worked as laborers, namely 16 subjects (35.6%) and the smallest number worked as farmers, namely 3 subjects (6.7%).[6]

Inguinal hernias are one of the most frequently encountered surgical problems, accounting for approximately 70-75% of all hernia operations.[2] The risk factor for the occurrence of hernias that has been obtained in a research result is that the number of respondents in the final elderly category was 16 people, covering around 35.6% of the total sample, with ages ranging from 56-65 years.[6] Most of the research respondents indicated that 35.6% of them worked as laborers.[6] Inguinal hernias occur more often in men than women,

with a percentage of 95.6%.[6]

According to Jenkins & Dwyer, based on a 2010 report from*World Health Organization* (WHO) who obtained data from*National Health Service* (NHS), it was found that approximately 70,000 inguinal hernia operations were carried out in England in the period 2001-2002. The operation involved as much as 0.14% of the population. Of this number, 62,969 operations were performed to repair primary hernias, while 4,939 operations were performed to repair recurrent hernias.[7] The operation performed to repair an inguinal hernia is a procedure that is often performed in various countries, one of which is the United States. Every year it is estimated that around 800,000 cases of inguinal hernia are operated on.[3]

Based on data obtained from Regional Health Research (2018), in 2017 in Indonesia, hernia was a disease that was ranked second after urinary tract stones with a total of 2,245 cases.[8] According to data obtained from the Health Services Section of the Gorontalo Provincial Health Service (2023), the number of inguinal hernia cases in Gorontalo Province recorded from 2019 - 2021 was 330 cases and spread across several districts/cities. With detailed numbers in 2019 there were 138 cases, in 2020 there were 67 cases, and in 2021 there were 125 cases.[9] Based on data obtained from the Medical Records Subdivision of Prof. Hospital. Dr. H. Aloei Saboe (2022), which is the place where this research was conducted, the number of patients confirmed with inguinal hernia at RSUD Prof. Dr. H. Aloei Saboe for the period January – December 2022, there were 104 cases. According to the Directorate General of YANKES (2021) that the Regional General Hospital Prof. Dr. H. Aloei Saboe Gorontalo is one of two class B hospitals in Gorontalo Province, located in Wongkaditi Village, Kota Utara District, Gorontalo City. This hospital is the largest referral hospital in Gorontalo Province in the Gorontalo City area.[10]

Methods

This research was carried out in September - October 2023 at RSUD Prof. Dr. H. Aloei Saboe, Gorontalo City, Gorontalo Province. This type of research is an observational descriptive study. The population in this study were all inguinal hernia patients who underwent examinations at the Prof. Regional General Hospital. Dr. H. Aloei Saboe for the period January – December 2022 which has medical record data for a total of 42 people and samples were taken using the *total sampling*.

The research variables used in this study are univariate variables, namely a description

of the risk factors for inguinal hernia patients including age, gender and occupation. Univariate analysis in this research is frequency, mean, median and mode using the application*Statistical Package for The Social Sciences* (SPSS).

Result

In Table 1, of 42 respondents, the age distribution of inguinal hernia patients was mostly found in the 56 - 65 year age group (12 patients, 28.6%). The gender distribution of inguinal hernia patients was mostly found to be male (36 patients, 85.7%). The distribution of work in inguinal hernia patients was mostly found in patients who did not work as many (8 patients, 19.0%).

Table 1. Distribution of respondents based on age, gender, and work of inguinal hernia patients in Aloei Saboe Hospital

Characteristics	Frequency	Percentage (%)
Age (years)		
0 – 5	4	9.5
5 – 11	1	2.4
17 – 25	2	4.8
26 – 35	3	7.1
36 – 45	5	11.9
46 – 55	7	16.7
56 – 65	12	28.6
> 65	8	19.0
Gender		
Male	36	85.7
Female	6	14.3
Working Status		
Unemployed	8	19.0
Civil Servants	3	7.1
Entrpreneur	4	9.5
Private Sector	6	14.3
Farmer	7	16.7
Fisherman	2	4.8
Housewife	3	7.1
High School Student	2	4.8
Retired	2	4.8
Labored	1	2.4

Table 2 indicate the sample's distribution based on diagnosis in inguinal hernia. Most of them were in patients with the main diagnosis of inguinal hernia (37 patients, 88.1%).

Table 2. Distribution of respondents based on main diagnosis and accompanying inguinal hernia patients in Aloei Saboe Hospital

Inguinal Hernia	Frequency	Percentage (%)
Primary diagnosis	37	88.1
Secondary diagnosis	5	11.9
Total	42	100

Discussion

The results of research conducted at RSUD Prof. Dr. H. Aloei Saboe used medical record data for 2022 and based on Table 2 shows that inguinal hernia patients at RSUD Prof. Dr. H. Aloei Saboe with the main diagnosis of inguinal hernia in 37 patients (88.1%) and the diagnosis of inguinal hernia accompanied by other diagnoses in 5 patients (11.9%). Of the 37 patients (88.1%) with a primary clinical diagnosis of inguinal hernia, there were 15 patients who were confirmed and written in the medical record data as having a reponible type of inguinal hernia, namely a hernia that occurs where the contents of the hernia can go in and out.[11] Meanwhile, irreparable hernias are hernias that occur when the contents of the hernia sac cannot be returned to the cavity.[11] From medical record data, 7 patients were recorded as having irreparable inguinal hernias while the rest were not recorded in the medical record.

Based on the data obtained, 5 patients (11.9%) were recorded in the medical record as having a diagnosis of inguinal hernia and accompanied by other clinical diagnoses such as incisional hernia and*suspect* incisional hernia, a history of previous hernia surgery, and the main diagnosis was even found to be other diseases such as chronic kidney disease (CKD), ascites, and dyspepsia syndrome. This is in line with the results of research conducted by Merry et al. which shows that several factors can trigger hernias, including increased intra-abdominal pressure due to diseases such as chronic cough, constipation, ascites and abdominal malignancies, as well as a history of frequently lifting heavy weights.[4] Apart from that, weakness of the abdominal wall muscles can also be a contributing factor, such as in cases of pregnancy, prematurity, old age, incision procedures that cause incisional hernias, and obesity. Several main diagnoses other than inguinal hernias found in medical record data may be related to the presence of triggering factors for the main diagnosis which resulted in inguinal hernias, so that the 5 patient data above were included in the list of hernia patients when the researchers carried out data collection.

Based on the analysed data, a minor subset of geriatric hernias, specifically in five individuals (11.9%), is attributed to comorbid conditions predisposing these patients to hernia

development. The study by Merry et al. elucidates that hernias can be precipitated by several factors, notably increased intra-abdominal pressure. This elevation in pressure can result from various pathologies, including chronic respiratory conditions leading to persistent coughing, constipation, ascites, and abdominal neoplasms. Additionally, a history of recurrently engaging in activities that involve lifting heavy objects has also been identified as a significant contributing factor.[4]

In the results of the data obtained, based on the medical records of patients with the main clinical diagnosis of CKD and ascites, they had a history of having had a hernia operation about 1 month ago before the patient was admitted to hospital. This is in line with research conducted by Zeitler & Wouk that herniation that occurs in the abdominal wall (umbilical, inguinal and incisional) is a complication of ascites and carries a risk of intestinal incarceration, intestinal strangulation and abdominal wall perforation.[12] Ascites occurs because there is an increase in intra-abdominal pressure which results in herniation of the abdominal wall.[12] According to research from Chiu et al., hernias that occur in the abdominal wall, especially inguinal hernias, account for 83.08% of all types of hernias in this study.[13] Patients undergoing*peritoneal dialysis* tend to experience increased abdominal pressure due to the presence of dialysis fluid in the abdominal cavity.[13] This increase in intra-abdominal pressure is consistent with the peritoneal volume inserted and is also associated with a higher risk of hernia development.[13] Findings from this study indicate that patients receiving PD have a higher risk of developing a hernia, which is 7 times higher than that of patients undergoing hemodialysis (HD).[13] In the research conducted by the researchers, the medical record data did not show any follow-up care received by patients with a primary diagnosis of CKD.

The results of the data obtained are based on the patient's medical records with the main clinical diagnosis in the form of*syndrome dyspepsia*has a differential clinical diagnosis of scrotal hernia. These results are in line with a case study conducted by Mehta et al., that in this case, an inguinal hernia caused gastric outlet obstruction, where mechanical resistance could prevent emptying of the stomach into the small intestine.[14] It has been assumed that if the greater omentum is pulled for a long time and if the hernia occurs continuously, it will cause the stomach to enter the small intestine.[14] So this is what is most likely to cause symptoms*syndrome dyspepsia*felt by the patient.

Based on the results of several previous studies and supporting theories, the researchers concluded from the existing data that 37 patients (88.1%) had a primary diagnosis of inguinal hernia and 5 patients (11.9%) had a diagnosis of inguinal hernia

accompanied by other diagnoses. The research results of the diagnosis of inguinal hernia accompanied by other diagnoses have various factors so that it can occur and be included in the inguinal hernia diagnosis category in the research data. Various factors are the reasons, including the close relationship between the process of inguinal hernia and the main diagnosis*syndrome dyspepsia,*CKD related to the therapeutic process and ascites.

From the results of research conducted at RSUD Prof. Dr. H. Aloei Saboe used medical record data for 2022 and based on Table 1 shows that inguinal hernia patients at RSUD Prof. Dr. H. Aloei Saboe most often occurs in the late elderly age group aged 56 – 65 years, as many as 12 patients (28.6%). This is in accordance with research conducted by Ryan et al. that several risk factors for the occurrence of hernias based on age are in the final elderly category, namely 16 people (35.6%), namely in the age range 56-65 years.[6] This research is not much different from research conducted by Agarwal which was conducted on 110 people at a treatment center in India. It was found that the largest age range for inguinal hernia sufferers was 43 patients (39.09%) aged >50 years.[15] This research is also in line with research conducted by Merry et al., that older people have a greater risk of experiencing inguinal hernias.[4] This factor is influenced by a person's age, where the chance of a decline in anatomy and organ function increases over time.[4] Hernia is a disease that can appear with age.[4] A study conducted by Columbia University Medical Center concluded that the decline in muscle strength in the aging process occurs due to calcium leakage from a group of proteins in muscle cells called ryanodine.[16] This triggers a series of events that limit muscle fiber contraction. With decreased calcium availability, muscle contractions become weaker.[13]

From a biological point of view, aging is the result of the accumulation of various molecular and cellular damages over time.[17] This damage leads to decreased physical and cognitive capacity, as well as increased risk of disease and death.[17] According to the theory of Professor Dame Linda Partridge, who serves as Director of Management at the Max Institute, she states that aging is a process that involves random things going wrong and never being corrected during evolution.[17] Several evolutionary reasons have been proposed to explain the accumulation of cellular and molecular damage over the life of an organism.[17]

The integrity and functionality of the transversal fascia tissue in resisting elevated intra-abdominal pressures arising from physiological and pathological states are contingent upon the structural condition of the collagen fibres that constitute the tissue's foundation and confer its tensile strength. The resilience of the transversal fascia is compromised by factors that negatively affect collagen biosynthesis, induce collagen degradation, or result in the

anomalous production of collagen fibres. This is exemplified in individuals who smoke, as they are subjected to noxious constituents in cigarette smoke that can disrupt normal collagen metabolism within the fascial tissue.[26]

The abdominal wall's structural integrity and mechanical stability are critically dependent on the composite architecture of its musculature and associated protective membranes. These biomechanical characteristics are significantly modulated by the qualitative and quantitative composition of the connective tissue matrix, particularly the types and distribution of collagen present. Type I collagen, characterized by its mature fibrillar structure, confers greater mechanical strength and resilience than Type III collagen, predominant during the initial wound healing and repair phases. The physiological ratio of Type I to Type III collagen in healthy tissue is typically maintained at approximately 4:1. Notably, in patients afflicted with inguinal hernias, this balance shows a demonstrable alteration, with an increased prevalence of Type III collagen fibres relative to Type I. This aberration in the collagen composition may underlie the compromised mechanical integrity observed in the abdominal walls of these individuals.[26]

The observed elevation in type III collagen within the study cohort was attributed to an enhanced expression of type III collagen mRNA, a deviation from the expression patterns typically observed for type I collagen. Concurrently, there was a notable increase in matrix metalloproteinase-2 (MMP-2) activity, an enzyme instrumental in the degradation of the extracellular matrix, among patients diagnosed with inguinal hernia. This biochemical alteration culminates in the formation of collagen tissue that is markedly thinner and demonstrates diminished mechanical integrity in comparison to normative benchmarks. Consequently, this compromised tissue structure facilitates the protrusion of abdominal contents through weakened segments of the abdominal wall, characteristic of inguinal hernia pathology.[26]

In the scope of this study, the investigation into smoking as a potential risk factor for inguinal hernia was not pursued. This omission was due to the limitations in the data extracted from medical records, which did not systematically record the patients' smoking status. Similarly, information regarding the history of prostate diseases or interventions, such as prostatectomy, was not available within the collected dataset. Notwithstanding, it is pertinent to highlight that existing literature and clinical observations suggest a correlation between prostatectomy, particularly radical prostatectomy, and an elevated risk of inguinal hernia. This association is primarily attributed to the procedural requirement of incising the lower abdominal wall muscles and fascia during a radical prostatectomy, thereby potentially

compromising the structural integrity of the abdominal wall and escalating the risk of hernia formation through the elevation of intra-abdominal pressure.

Based on the results of previous research and supporting theories, the researchers concluded that inguinal hernias occurred more frequently in patients aged 56 - 65 years, namely 12 patients (28.6%). This is because, as a person's age decreases, several organ functions in the body also decrease, such as the body's anatomical functions. According to a study conducted by Erianto et al., increasing a person's age has an impact on decreasing the function of the body's systems, making them more susceptible to various diseases.[18]

Increasing age is also closely related to the prognosis of a disease and life expectancy. This is also in line with research from Budiono & Rivai that the health of the elderly declines with age, thus affecting their quality of life.[19] Increasing age will cause a decrease in body function, the emergence of various diseases, body imbalance and the risk of falls.[19]

From the results of research conducted at RSUD Prof. Dr. H. Aloei Saboe used medical record data for 2022 and based on Table 2 shows that inguinal hernia patients at RSUD Prof. Dr. H. Aloei Saboe most commonly occurs in men, namely 36 patients (85.7%). This is in accordance with research conducted by Kwartawati et al., of the total participants registered for the activity and who were respondents to the research, totaling 115 people, there were 105 men and 10 women.[20] Similar research was also carried out by Dewi where the results of the research were that the gender of inguinal hernia patients was 57 people or 96.61%.[20]

Based on the theory of Erianto et al., that the incidence of hernias is more common in men than women, and this difference is caused by differences in the development process of the reproductive organs in male and female fetuses.[18] In male fetuses, the testicles descend from the abdominal cavity into the scrotum between the seventh and eighth months of pregnancy.[18] This canal hole will generally close before birth or before the baby reaches one year of age.[18] In adulthood, this area can become a weak point that has the potential for a hernia.[18] Adult men tend to be more active and often lift heavy loads, thereby increasing intra-abdominal pressure, which is a risk factor for inguinal hernias.[18]

According to research conducted by Alifta Kinanti et al., based on observations of the community, there is a tendency that women are more often involved in activities related to caring for children, while men are more likely to be involved in activities that emphasize physical strength and competition.[22]

Based on previous research and supporting theories, the researchers concluded that inguinal hernias occurred more frequently in male patients, namely 36 people (85.7%). This

is due to several factors, namely differences in the process of reproductive organ development in men which are different from women, apart from that, the severity of activities generally carried out by men is in the form of heavy activities.

The results of research conducted at RSUD Prof. Dr. H. Aloei Saboe used medical record data for 2022 and based on Table 1 shows that inguinal hernia patients at RSUD Prof. Dr. H. Aloei Saboe most often occurs in patients who do not work, as many as 8 patients (19.0%). The results of this study are in line with the results of research conducted by Kurnia et al., where the duration of work can also be a risk factor for increasing the incidence of inguinal hernias, especially in jobs with moderate and heavy levels of work carried out for more than 1 year.[7] This research shows that the risk increases by 4 times in the context of work of longer duration.[7]

This is in line with research by Wagner that one of several other possibilities that could be the cause of an inguinal hernia is that there is a congenital connective tissue disorder.[23] This is also in line with this study which found that there were 8 patients (19.0%) who were no longer working and 5 of them were patients aged between toddlers and children.

If related to theory, according to research conducted by Merry et al., this is influenced by the increasing age of a person, the greater the possibility of anatomical and functional decline in his organs and hernias are one of the diseases that can be caused by increasing age.[4] In patients who are elderly, habits or activities in their youth often involved doing moderate or heavy work. The results of this study show that the majority of patients are men who do not work and are elderly. A man who has a greater opportunity to do moderate activities or work tends to be heavy. In another study, it was stated that there was a decrease in testosterone levels in the blood and an increase in estrogen through the activity of the aromatase enzyme which is associated with the aging process. The lower abdominal muscles are sensitive to the hormone estrogen in the body and tend to express very high levels of estrogen receptor-α. As a result, increased estrogen concentrations can result in atrophy and fibrosis of the lower abdominal muscles, which can lead to hernias in men.[24]

For toddlers and children who in this study are included in the non-working category, this is influenced by congenital abnormalities in the tissue which triggers the occurrence of inguinal hernias. Most hernias and hydroceles that occur in children are caused by failure to close the processus vaginalis. During fetal development, the testes are initially located in the peritoneal cavity. When the testicles descend through the inguinal canal into the scrotum, this is followed by an extension of the peritoneum that resembles a sac, known as

processesus vaginalis.[25] After the testis descends, the processesus vaginalis normally closes in a healthy baby and turns into fibrous fibers without a lumen.[25] If the processus vaginalis is not closed properly, this condition is known as patent processus vaginalis (PPV) which leads to the risk of a hernia.[25]

Based on previous research and supporting theories, the researchers concluded that inguinal hernias occur more often in patients who are no longer working, namely based on data for patients who do not work consisting of groups of patients aged > 65 years and also in children under school age. . In this study, researchers did not conduct direct interviews with patients so that their work history during their youth is unknown, and it cannot be ascertained whether the patient did work that tended to be moderate or even heavy on a daily basis. Patients with a history of working and carrying out activities that tend to be strenuous are at greater risk because muscle strength is decreasing because they have done a lot of heavy activities and this is also made worse by the age factor and the aging process that occurs in it which is experienced by elderly patients.

In this study, the researcher had several limitations, including that the data obtained from initial data collection in the medical record section was different from the data obtained in the field when the researcher was going to conduct the research. In this study, there were several patient data statuses that were not available when a search was carried out when the researcher had conducted the research.

Conclusion

Distribution of inguinal hernia patients at RSUD Prof. Dr. H. Aloei Saboe is most common in the late elderly age group with male gender, the majority are no longer working and most of the patients have the main diagnosis of inguinal hernia. It is hoped that after this research, the hospital can further improve the system, especially in terms of archiving medical records..

Conflicts of Interest

Nothing to declare

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Nothing to declare

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