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LINEAR MEASUREMENT OF THE CONDYLE POSITION IN HIV-INFECTED CHILDREN AND ADOLESCENTS

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ABSTRACT
Background: *The incidence of HIV had recently increased rapidly. People infected with HIV were required to take anti-viral drugs. The severity of HIV also contributes to a decrease in bone mineral density due to taking antiviral drugs. Decreased bone density in people with HIV was a chronic disease due to the long-term use of drugs. TMD in people with HIV was often associated with several factors including emotional states such as depression. Patient infected HIV was vulnerable to TMD because it triggers physical and psychological changes. TMD and decreased bone density are common in people with HIV. Researchers hope that later there will be the latest findings that can make patients infected with HIV felt safe to take drugs without worrying about the decline in bone quality.* ***Objective:*** *This study aimed to investigate the value of linear measurement of the condyle position in HIV- infected children and adolescents based on panoramic radiographs in Dental Hospital Padjadjaran University.* ***Methods:*** *This descriptive and cross-sectional method was conducted on panoramic radiographs of HIV-infected children and adolescents since was born. Condyle position was defined by linear measurement using a protractor that divides the condyle 45° of anterior, 90° of superior, and 135° of posterior joint space from a horizontal line. The distance was then measured using a digital caliper.* ***Results:*** *According to linear measurements of the condyle position, all samples had abnormal linear distances in children and adolescents in all gender. The standard range of anterior joint space (Ajs) was 1.3 mm, superior joint space (Sjs) was 2.1 mm, and the posterior joint space (Pjs) was 1.8 mm. The result of this research, the right women condyle sample, the standard distance of the AJS was 0%, SJS was 16%, Pjs was 18%. While the left condyle, the usual range of the AJS was 4%, SJS was 12%, Pjs was 24%. The right men condyle sample, the standard distance of the Ajs was 0%, Sjs was 17.65%, Pjs was 11.76%. While the left condyle, the usual range of the Ajs was 0%, Sjs was 11.76%, Pjs was 5.88%.* ***Conclusions:*** *The abnormal distance measured was found in the condyle position of children and adolescents infected with HIV.*

Keywords: Linear measurement condyle, anterior space, superior space, posterior space, HIV-infected children, and adolescents.

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INTRODUCTION

The incidence of HIV disease in the world is quite high. In 2018, 37.9 million people living with HIV, which is around 36.2 million adults and 1.7 million children (<15 years). Based on facts from UNAIDS, 23.3 million people living with HIV were accessing antiretroviral therapy, up from 7.7 million in 2010. Currently, 1.7 million people have become infected with HIV.[1]

Patients infected with HIV have many problems, both medical and psychological. HIV patients are also required to take medication for life.

There is no cure for HIV-infection. However, effective and efficient antiretroviral drugs can control the virus and help prevent infection and transmission, so that people with HIV disease and those at high risk can enjoy healthy, long and productive lives.[2]

Highly active antiretroviral therapy has best improved the prognosis of patients infected with HIV. Metabolic complications related both to living with HIV long term and the use of antiretroviral treatment have increasingly been noted, and several groups have reported reduced bone mineral density (BMD) in HIV infection.[3]

The mechanism by which antiretroviral drugs act on the bone is not yet precise, but some hypotheses can be made concerning their action directly on bone remodeling or indirectly vitamin D metabolism.[4]

Great and significant advances in the treatment of HIV infection have occurred over the past few years. HIV protease inhibitors and non-nucleotide reverse transcriptase inhibitors make it possible to use a combination of highly active antiretroviral drugs that can inhibit HIV replication. The use of HAART has significantly reduced the morbidity and mortality rates from HIV infection. This progress is not without problems but also has side effects. HAART indicate to have significant bone demineralization. Therefore, HAART associated with an increasing prevalence of osteopenia and osteoporosis, which may increase the risk of fracture in people living with HIV/AIDS. [5]

A panoramic radiograph was an imaging technique that frequently used because it produces a full panorama, small doses, and simple procedure. Panoramic can be used to evaluate bony lesion or un eruption tooth that cannot be seen with intraoral technique, assessment periodontal bone support, for the evaluation of wisdom teeth before planned surgical intervention, an orthodontic evaluation to determine the state of the dentition and the presence or absence of teeth. Besides, in dental hospitals, panoramic radiographs are also used to assess: dental fracture, fracture of the mandible, destructive diseases of the articular surfaces of the TMJ, vertical alveolar bone height and position of anatomical structures as part of pre-implant planning treatment.[6]

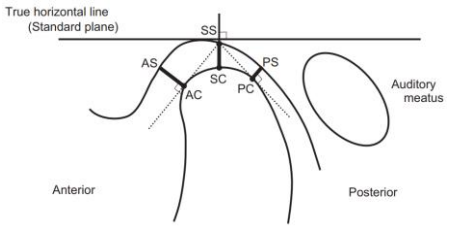
Panoramic radiography has been to be a simple and useful first-line technique for detailing morphological condylar abnormalities such as erosion, sclerosis, osteophyte formation, and resorption. The radiographic examination of TMJ allows the joint spaces to be viewed in sagittal or lateral images and axial and coronal images of TMJ radiographically. The sagittal view of TMJ provides the visibility of Anterior Joint Space, Superior Joint Space, and Posterior Joint Space. According to Ikeda and Kawamura, Anterior joint space (Ajs): Expressed by the shortest distance between the most anterior point of the head condyle and the posterior wall of the articular tubercle. Superior joint space (Sjs): Measured from the shortest distance between the most superior point of the head condyle and the most superior point of the mandibular fossa. Posterior joint space (Pjs): Represented by the shortest distance between the most posterior end of the condyle and the posterior wall of the condylar fossa [7–9]

Linear measurement of the condyle position on a panoramic radiograph can be determined from anterior, superior, and posterior distances. The true horizontal line (THL) parallel to the floor with the patient in the natural head position was used as the reference plane. Superior joint space (SS) was defined as the distance measured along a line perpendicular to the THL extending from the most superior condyle point (SC) to the glenoid fossa. Lines tangent to the most prominent anterior and posterior aspects of the condyle were drawn from the intersection of the perpendicular line and the glenoid fossa. Distances from the anterior (AC) and posterior (PC) tangent points to the nearest location on the glenoid fossa were measured as the anterior joint space (Ajs) and posterior joint space (Pjs). The standard anterior joint space is 1.3 mm. superior joint space of 2.1 mm and posterior joint space of 1.8 mm. [10]

This study aimed to investigate the value of linear measurement of the condyle position in HIV-infected children and adolescents based on panoramic radiographs.

RESEARCH METHODS

This descriptive and cross-sectional method was conducted on panoramic radiographs of HIV-infected children and adolescents. Condyle position was defined by This study aimed at measurement using a protractor which divides the condyle 45° of anterior, 90° of superior, and 135° of posterior joint space from a horizontal line. The distance was then measured using a digital caliper.



Gambar 1 Landmarks and linear measurements of the space between the condyle and the glenoid fossa in the sagittal plane.

RESULTS

	Male					
	Right			Left		
	AJS	SJS	PJS	AJS	SJS	PJS
Normal Value	1.3 mm	2.1 mm	1.8 mm	1.3 mm	2.1 mm	1.8 mm
Sample infected HIV	0	3	2	0	2	1
Percentage	0.00%	17.65%	11.76%	0.00%	11.76%	5.88%

	Female					
	Right			Left		
	AJS	SJS	PJS	AJS	SJS	PJS
Normal Value	1.3 mm	2.1 mm	1.8 mm	1.3 mm	2.1 mm	1.8 mm
Sample infected HIV	0	4	2	1	3	6
Percentage	0.00%	16.00%	8.00%	4.00%	12.00%	24.00%

According to linear measurements of the condyle position, all samples had abnormal linear distances in children and adolescents in all gender. The standard range of anterior joint space (Ajs) was 1.3 mm, superior joint space (Sjs) was 2.1 mm, and the posterior joint space (Pjs) was 1.8 mm. The result of this research, the right women condyle sample, the standard distance of the AJS was 0%, SJS was 16%, Pjs was 8%. While the left condyle, the usual range of the AJS was 4%, SJS was 12%, Pjs was 24%. The right men condyle sample, the standard distance of the Ajs was 0%, Sjs was 17.65%, Pjs was 11.76%. While the left condyle, the usual range of the Ajs was 0%, Sjs was 11.76%, Pjs was 5.88%.

DISCUSSION

The causes of low BMD in HIV appear to be multifactorial and likely represent a complex interaction between HIV infection, traditional osteoporosis risk factors exacerbated by consequences of chronic HIV infection (e.g., poor nutrition and low weight), high rates of tobacco and alcohol use, low vitamin D levels, and ART-related factors. Patients with ART have a high prevalence of osteopenia, which suggests that uncontrolled viremia can impact BMD, likely mediated by the effects of systemic inflammation on bone remodeling. Specifically, HIV proteins increase osteoclastic activity and decrease bone formation by promoting osteoblast apoptosis. Furthermore, elevated tumor necrosis factor (TNF) α increases osteoclast-mediated bone resorption without concomitant increases in bone formation.[11,12]

The HIV infection associated or not with states of immune activation and inflammatory processes, may change osteoclastogenesis by increasing the rate of apoptosis of primary osteoblasts, reducing calcium deposition and alkaline phosphatase activity, diminishing specific bone proteins and compromising the differentiation of mesenchymal cells into osteoblasts. During HIV infection, levels of various inflammatory cytokines, such as tumor necrosis factor-a (TNF-a), are elevated as part of the immune response but can also stimulate bone resorption. Moreover, the long-term use of HAART may be responsible for systemic alterations that affect the growth of these children.[13,14]

Osteoporosis is common in HIV-infected persons. The cause is likely multifactorial involving traditional risk factors such as smoking, alcohol use, opiate use, physical inactivity, low body weight, vitamin D deficiency, and the direct effects of antiretroviral therapy (ART). Evidence and research suggests that the increasing prevalence of osteoporosis in HIV-infected persons connected into a higher risk of bone fracture.[15]

There is a need for more specific investigations to gain a better understanding of a possible link between HIV infection and TMD during active retroviral therapy. TMD (TMJ arthralgia) in a patient with HIV infection receiving active retroviral treatment with protease and NRT inhibitors. There are four possible explanations for the presence of TMD in an HIV patient. First, HIV infection may cause rheumatic manifestations such as aspecific myalgia, arthralgia, arthritis, tendonitis, or fibrous capsulitis with the potential for joint space reduction. TMJ involvement has also been reported. Second, it is known that the proteases and NRT inhibitors may cause rheumatological joint symptoms with pain, stiffness, and movement limitations. Protease inhibitors not only crystallize in the urinary tract causing urolithiasis, but protease inhibitor crystals have also been found in the joint fluid of patients with a “frozen” shoulder. These crystals could trigger joint inflammation. In the report by Florence, the joint pain improved substantially after a medication switch; this suggests a cause-effect relationship. In the case of the patient reported here, the physician would not discontinue the current retroviral therapy due to the risk of jeopardizing the control over the virus infection load. Thus, it is impossible to know whether the medication was the TMD cause. Third, the TMD could have been triggered by the change in the patient’s psychosocial status, possibly leading to parafunction. Fourth, it cannot be excluded that the association was fortuitous since TMD are not rare

conditions.[16] Based on this study, the abnormal distance measured was found in the condyle position of children and adolescents infected with HIV.

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