

# The Relationship between Phimosis, Smegma, and Preputial Bacteria with Inflammatory Status of Circumcised Patient

Paksi Satyagraha, Muhammad Miftahul Firdaus, Pradana Nurhadi, Besut Daryanto

**Abstract:** *Phimosis is the inability of the penis to protrude from the prepuce either partially or completely and the preputial retractability increases with age. Circumcision is believed by various parties as a form of defense against pathogens that may cause various abnormalities. Smegma is whitish lump that formed from desquamation of preputial epithelial cells. Smegma and bacteria in the prepuce may cause abnormalities such as genital infections, urinary tract infections, and even malignancy. This study aims to determine the presence between phimosis, smegma, and preputial bacteria, and its relationship with inflammatory status of circumcised patient. A cross sectional analytical study for boys who underwent circumcision at Saiful Anwar General Hospital Malang. The data will be analyzed using chi-square and will be calculated for the relative risk. There were 76 patients who underwent circumcision from March 2018 until August 2018. The result was found that the presence of phimosis was significantly associated with the presence of smegma and preputial bacteria ( $p < 0.01$ ) with a risk of 30x and 8x respectively. However, the presence of smegma and preputial bacteria in the prepuce was not significantly associated with the inflammatory status in the prepuce ( $p = 0.541$  &  $p = 0.084$ ). In conclusion, the presence of phimosis has a significant risk in the formation of smegma and the growth of preputial bacteria.*

**Keywords:** Raung volcano, volcanic tremor, Maximal Lyapunov Exponent, spectral analysis

## I. INTRODUCTION

Phimosis is inability to retract the prepuce either partially or completely due to natural adhesions between the skin layer of the glans and inner preputial skin. Prepuce spontaneously separates from the glans as age increases. In 90% of cases, natural separation allows the prepuce to retract on uncircumcised boys 3 years of age and less than 1% by 17 years of age with phimosis. Infection, paraphimosis, urinary tract infection (UTI), and cancer are some conditions associated with the uncircumcised penis.<sup>1</sup>

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\*Correspondence author

**Paksi Satyagraha**, Department of Urology, Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia,  
Email: paksisatyagraha@gmail.com

**Muhammad Miftahul Firdaus**, Department of Urology, Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia

**Pradana Nurhadi**, Department of Urology, Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia,

**Besut Daryanto\*** Department of Urology, Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia, Email: besut.daryanto@yahoo.co.id

Circumcision is a surgical procedure that has been done since the ancient times<sup>2</sup>. Circumcision is believed by various parties as a form of defense against pathogens that may cause various abnormalities<sup>3</sup>. Smegma is whitish lump that formed from desquamation of preputial epithelial cells<sup>4</sup>. Smegma and bacteria in the prepuce may cause abnormalities such as genital infections, urinary tract infections, and even malignancy<sup>2</sup>. This study aims to determine the relationship between phimosis, smegma, and preputial bacteria with inflammatory status of circumcised patient.

## II. MATERIALS AND METHODS

A cross sectional analytical study for boys who underwent circumcision at Saiful Anwar General Hospital Malang. The data will be analyzed using chi-square and will be calculated for the relative risk. There were 76 patients who underwent circumcision from March 2018 until August 2018. This study has been approved by Ethical Committee of Medical and Health Research, Faculty of Medicine, Universitas Brawijaya (400/55/K.3/302/2018).

## III. RESULTS AND DISCUSSION

The majority of patients were children in the age group of 5-9 years, 23 (30%) children. There were 47 (62%) patients have phimosis. 43 (57%) patients were having smegma. From the pathology anatomy examination of preputial skin, there were PMN cells in 37 (79%) patients and MN cells in 10 (21%) patients.

Most of them have phimosis. They who have phimosis decreases with age. This can be seen in the age group 0-2 years and 3-4 years, where the majority of patients have phimosis. But over the age of 5, the phimosis begins to decrease. There were 39 (91%) patients with phimosis found having the smegma and 4 (9%) patients without phimosis found having the smegma.

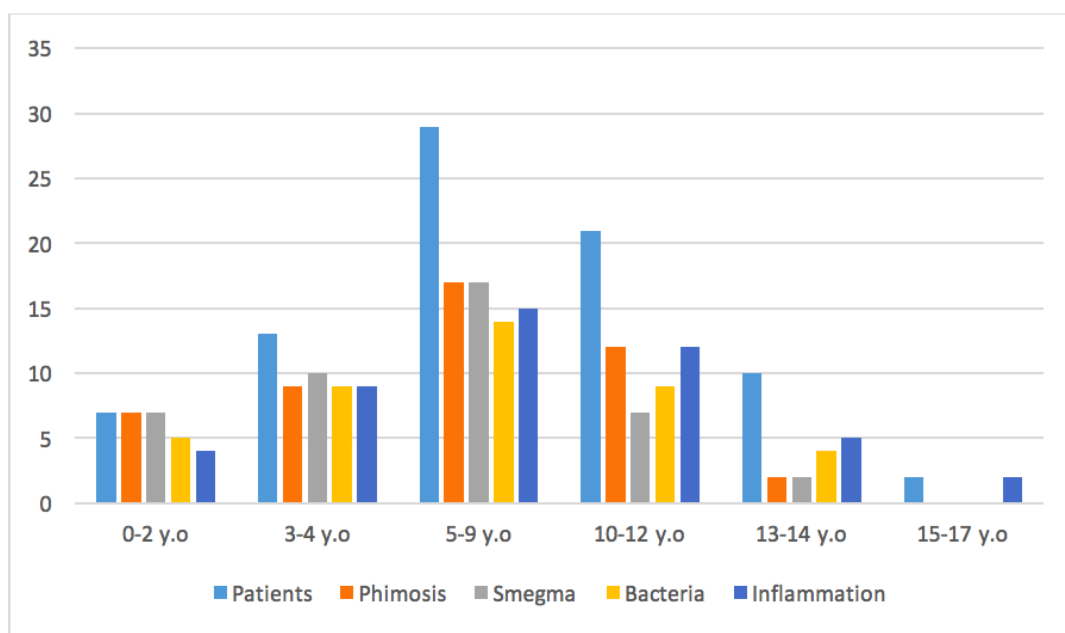
As many as 28 (72%) patients with phimosis and smegma, found having bacterial growth and 11 (28%) patients with sterile results. On pathology anatomy results, there were found 27 (69%) patients with inflammatory cells. In phimosis patients without smegma, 6 (75%) patients were found with bacterial growth and 2 (25%) with sterile results. On pathology anatomy examination found 5 (62%) have inflammatory cells. In patients without phimosis with smegma, there was 1

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(25%) patient with bacterial growth and 3 (75%) patients with sterile results. Pathology anatomy examination found 1 (25%) patient with inflammatory cells.

In patients without phimosis and without smegma, there were 6 (24%) patients with bacterial growth, and 19 (76%) with sterile results. The pathology anatomy examination found 14 (56%) with inflammatory cells. From examination of microbiology culture, there were 41 (54%) bacterial growth and 26 (63%) of which is a Staphylococcus negative coagulase. This can be seen in Figure 1.

The SPSS examination found a significant relationship ( $p < 0.01$ ; OR = 30.4), between the presence of phimosis and the presence of smegma. The presence of phimosis is also significantly associated with the presence of preputial bacteria ( $p < 0.01$ ; OR = 8.2). However, when seen from the presence of smegma with the preputial inflammatory status, no significant relationship was found ( $p = 0.502$ ). In addition, the presence of bacteria was also not found to be significantly associated with inflammatory status in the patient's prepuce ( $p = 0.084$ ).



**Fig. 1. Phimosis, smegma, bacteria, and inflammation events in each age groups**

In this study showed a significant relationship between phimosis and the presence of smegma ( $p < 0.01$ ), with the risk of having a smegma of 30x compared to those who hasn't. In this study 47 (62%) of the total 76 patients experienced phimosis. In 39 (83%) patients with phimosis there were smegma and 8 (17%) patients without it. Smegma is whitish lump that formed from desquamation of preputial epithelial cells<sup>4</sup>. Lack of hygiene is believed as a factor in the smegma formation, but this study does not seek further of the patient's hygiene level.

The presence of preputial bacteria was also measured in this study and an analysis of its relationship with phimosis was carried out. We found a value ( $p < 0.01$ ) so that the presence of phimosis significantly associated with the presence of preputial bacteria, with the relative risk was 8x compared to patients without phimosis. The results of microbiological examination showed that 41 (54%) cases found bacterial growth and 35 (46%) were sterile. In patients who have phimosis with smegma, there were 28 (72%) patients experiencing bacterial growth while 11 (28%) sufferers with sterile results. Then for phimosis cases without smegma, a total of 8 cases were obtained and 6 (75%) patients found bacterial growth while 2 (25%) cases with sterile results.

Tokgöz in 2015 reported the incidence of bacterial growth

in all patients with phimosis and in patients without phimosis, the presence of uropathogens was identified as 48.1%<sup>6</sup>. Other study also shows that the majority of patients with phimosis have a higher risk of developing bacterial colonies than patients without phimosis<sup>7</sup>. In general, the prepuce has normal flora but over time, pathological conditions such as persistent phimosis with poor hygiene will change the atmosphere of acidity and oxygenation of the area so that it can produce the development of pathogenic bacteria<sup>8</sup>. Phimosis can cause stagnant of urinary flow in the prepuce, thereby increasing bacterial colonization and increasing the possibility of ascending urinary tract infections<sup>9</sup>. Patients with phimosis may have pathogenic bacteria such as diphtheroids, enterococci, and klebsiela. In the Ladenhauf study in 2013 found the bacterial growth on the glans penis after circumcision was performed on 143 boys with phimosis. The results of the study stated that 142 cases of swab contained bacterial growth and 138 of samples were pathogens<sup>7</sup>. In this study the majority of patients, 41 (54%) had bacterial growth and 35 (46%) patients with sterile results. The most bacterial type in this study was Staphylococcus negative coagulase as many as 26 (34%) cases, followed by Escherichia coli with 7 (9%), Citrobacter diversus 3

(4%), *Enterobacter gergoviae* 2 (3%), *Klebsiella rhinoscleromatis* 2 (3 %), and *Proteus mirabilis* in 1 (1%).

This is similar to some existing studies. Other studies mention that bacteria found in the prepuce were *Staphylococcus* negative coagulase (12.5%), *Klebsiella* (18.8%), *E. coli* (3.1%) and *Enterococcus* group (43.8%)<sup>5</sup>. The *Staphylococcus* negative coagulase bacteria are a bacterium that is often found on the surface of the skin as a normal flora. This bacterium is types of bacteria that are non-pathogenic<sup>10</sup>.

Based on the results of this study, the presence of smegma did not have a significant relationship with inflammatory status of the prepuce ( $p = 0.502$ ). Indeed, so far it has been known that smegma can be an irritant that can cause inflammation process<sup>11,12</sup>. But an irritant substance can cause inflammation when its exposed to sufficient amount of duration and concentration<sup>13</sup>. It is possible that the patients in this study, does not have enough concentration of the smegma or not exposed long enough to cause irritation that can cause inflammation.

In this study it was found that the presence of bacteria did not have a significant relationship with inflammatory status in the prepuce of patients ( $p = 0.084$ ). The presence of bacteria can be an inflammatory triggering factor, especially the urea splitter bacteria, because ammonia as a result of hydrolysis of urea from urine can trigger inflammation of the prepuce<sup>14</sup>. But not all bacterial can cause infections which are then marked by inflammation<sup>15</sup>. The type of bacteria, the number (dose) of bacteria, and the duration of exposure of bacteria at a certain location in the body determine the possibility of inflammatory process<sup>16</sup>. In this study there may not be an inflammatory process in the prepuce because one of these factors is not fulfilled, basically the presence of a bacterial colony does not always indicate an infection process.

In this study it was found that the presence of PMN cells in the majority were found in 37 (79%) cases and MN in the remaining 10 (21%) cases. PMN cells in general can be found at the location of an acute infection process in a period of <48 hours. PMN cells itself is the first line of defense in the event of acute infection and the presence of foreign objects that hurt the body<sup>17</sup>. Whereas in more chronic cases, the majority of inflammatory cells will be replaced by MN cells<sup>18</sup>. Acute inflammatory events in this study apart from the infection process, can also occur due to the reaction of the circumcision itself.

#### IV. CONCLUSION

The presence of phimosis has a significant risk in the formation of smegma and the growth of preputial bacteria. There was no significant relation neither the phimosis, smegma, or preputial bacteria with inflammatory status of the prepuce. Further research is needed with strict bias control.

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#### AUTHORS PROFILE



**dr. Paksi Satyagraha Sp. U** has completed his urologist degree from Airlangga University. He is currently working as urology staff in Urology Department, Consultant in Genitourinary Reconstructive Surgery, Brawijaya University, Malang. He is founder faculty of International Society of Reconstructive Urology (ISORU).

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**dr. Muhammad Miftahul Firdaus** has completed his medical degree in Faculty of Medicine, Brawijaya University. He is currently as urology resident in Brawijaya University, Malang



**dr. Pradana Nurhadi Sp. U** has completed his urologist degree from Airlangga University. He is currently working as urology staff in Urology Department, Brawijaya University, Malang.



**Dr. dr. Besut Daryanto Sp. B, Sp. U (K)** has completed his general surgeon from Diponegoro University, and urologist degree from Airlangga University. He has completed his doctoral in Brawijaya University. He is currently working as a Head of Urology Residency Program Medical School of Brawijaya University. He has published 20 research paper in International Journal.