POST-ADENOTONSILLECTOMY MONOCYTE MODULATION IN CHILDREN WITH OBSTRUCTIVE CHRONIC ADENOTONSILLITIS

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ABSTRACT

Obstructive chronic adenotonsillitis (OCAT) is an inflammation of adenoid and tonsil that may result in obstruction and followed by hypoxia. As a stressor, hypoxia may modulate immunity. Adenotonsillectomy (ATE) is an indication for surgery for children with OCAT. ATE is a surgical procedure that most commonly undertaken to children. However, the necessity of such operation remains controversial, since adenoid and tonsil are parts of the immune system. The objective of this study was to identify the role of monocyte as a component of post-operative natural immunity. This study used prospective pre-post design. A number of 15 children with obstructive chronic adenotonsillitis (OCAT) underwent operation. Two weeks after operation, a significant reduction of monocyte (p < 0.05) was found. The post-ATE reduction of monocyte count resulted from successful surgical eradication of hypoxia and the source of infection from adenoid and tonsil.

Keywords: obstructive chronic adenotonsillitis, hypoxia, stressor, adenotonsillectomy

INTRODUCTION

Until recently, a proportion of 60% of patients with chronic adenotonsillitis still experience recurrent infection. Additionally, these patients also showed obstructive upper respiratory symptoms (Paradise et al, 2003) that often occur during bedtime (Onal et al, 1986; Spabis, 1994; Lamberg, 2001). Chronic adenotonsillitis accompanied with obstruction at night is termed as obstructive sleep apnea syndrome (OSAS) (Suen et al,1995; Adams, 1997; Cowan and Hibbert, 1997; Ishizuka et al, 1997). Obstructive chronic inflamed adenoid and tonsil is called as obstructive chronic adenotonsillitis (OCAT) (Jensen et al, 1991; Salah et al, 2001). Obstruction accompanied with a chronic inflammation presents as a vicious circle. Infection-resulted inflammatory process may produce tonsillar enlargement, while the enlargement of tonsil and adenoid may result in the obstruction of upper respiratory tract. Increased morbidity rate among the patients may further disturb growth and development, particularly during childhood (Paradise et al, 2002; 2003). The obstruction of respiratory tract, particularly the one that occurs during bedtime, may result in hypoxia, a condition that may reduce the immunological defense of the body (Lamberg et al, 2001; Paradise et al, 2003). Adenoid enlargement can be measured by means of lateral cephalic x-ray photo using soft-tissue technique. A comparison of adenoid size and that of nasopharyngeal cave is available today (Ranidewi, 1995; Kemaloglu et al, 1999). If the ratio of adenoid and nasopharynx (A - N) is between 0 and 0.52, this indicate the absence of hypertrophy, while 0.52 - 0.72 indicated the presence moderate non-obstructive hypertrophy, and 0.72 indicated obstructive hypertrophy (Ranidewi, 1995). According to MacKency (Priyanto, 1997), the size of tonsil is determined by T1, T2, and T3. Adenotonsillectomy (ATE) is a procedure to overcome OCAT-resulted obstruction, although this procedure remains controversial, which is due to the fact that adenoid and tonsil are parts of the immune system, while, on the other hand, their enlargement leads to hypoxic condition (Paradise et al, 2002; 2003). In addition, tonsil and adenoid are organs where B and T cells reside (Yamanaka et al, 1988; Boyoka et al, 2000). Prusek et al (1991) and Friday et al (1992) reported post-ATE immunity reduction. Paulussen et al (2000) found a post-ATE increase of cellular and humoral response. However, the mechanism of post-ATE immunity modulation still requires further elaboration.

The otolaryngologists in Indonesia have frequently undertaken ATE. During the year 2002 in Dr Moewardi Hospital, Surakarta, a number of 220 ATE and Tonsillectomy (TE) procedures had been carried out among other 501 otolaryngological procedures or operations. More than 65% of patients undergoing ATE or TE aged between 2 and 15 years (Dr Moewardi Hospital, 2002). In Turkey, ATE comprised 75% of otolaryngological operations in children (Erisen et al, 1999). Enlarged adenoid and tonsil may result in obstruction, and physiologically it may also impede respiratory function and swallowing process. Due to these considerations, patients with OCAT should undergo ATE. Otherwise, the pediatric patients’ quality of life may reduce (Gatehouse et al, 1996). OCAT may lead to a hypoxic condition, and the latter may modulate immunocompetent cells (Eike and Jorgensen, 1994; Albert, 1997; Battistini et al,
Obstructive symptoms would be eradicated after ATE procedure is carried out (Franz and Mennicken, 1977; Harrington, 1978; Skevas et al, 1978). Since the benefit of the ATE remains less totally clear, an elaborate study is worth to be done.

Hypoxic stressor may serve as a triggering factor for the reduction of immunity (Putra, 1999). One component of natural immunology is the monocyte. In hypoxic condition, monocyte and macrophage may release more abundant IL-1β (Hempel et al, 1996; Carta et al, 2001). Furthermore, IL-1β stimulates Th1 to release IFN-γ. As a MAF (macrophage activating factor), IFN-γ may raise macrophage capacity to process and destroy immunogen. Monocyte and macrophage are components of natural immunity that are able to modulate adaptive immune system, either cellular or humoral. Both are immune cells that often receive external reactions. Therefore, stressor that presents as hypoxia may also induce stress in monocyte. In addition to activate monocyte in producing cytokine, stress may also increase or reduce monocyte count. This study was aimed to identify post-ATE change of monocyte count in patients with OCAT.

**PATIENTS AND METHOD**

This study used prospective pre- and posttest design. No control used in this study since it was ethically not allowable to perform ATE in normal subjects. Samples were populaton that met the treatment criteria (accessible sampling), i.e., pediatric patients with OCAT visited the Outpatient Clinic of the Department of Otolaryngology, Sebelas Maret University, Dr Moewardi Hospital, Surakarta. The inclusion criteria were adenoid enlargement (A - N ratio 0.72); tonsillary enlargement (T2, T3, bruised, enlarged crypt orifice with positive detritus); male; aged 5 - 15 years; normal bodyweight (height - 110) ± 10% kg; normal health status as proved by laboratory test to erythrocyte, hemoglobin, Hct, leucocyte count, blood clotting and bleeding time, hepatic function (SGOT/SGPT), renal function (creatinine), and total protein; and informed consent by the parents or family. The exclusion criteria were as follows: presence of other abnormalities that result in nasal blockade, such as polyp, deviated septum, and tumor; other causes of immunity modulation, such as allergic rhinitis, asthma, atopic dermatitis, and diabetes mellitus; and ATE contraindication, for example, blood clotting abnormalities. Sample size was based on the estimation of Hulley et al (1988) using a (one tailed) of 0.05 and b 0.20, with expectation of 0.90. Estimation revealed that the number of minimal sample was 15.

The dependent variable in this study was monocyte count, as measured by means of peripheral blood examination with an instrument Cell dyn 3500. This study was undertaken at the Department of Otolaryngology, Sebelas Maret University, Dr
Moewardi Hospital, Surakarta, from February to September 2002. Data analysis was performed using statistical test with significance level of 0.05. Homogeneity test was done to the data of moderator variable in order to find the homogeneity of samples, thereby it would be possible to conclude that monocyte modulation was an effect of ATE.

**RESULTS**

Results of this study can be seen in the following table:

<table>
<thead>
<tr>
<th></th>
<th>Total Cases</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>15</td>
<td>519.65204</td>
<td>142.34015</td>
</tr>
<tr>
<td>Post</td>
<td>15</td>
<td>203.41219</td>
<td>52.52080</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>437.26684</td>
<td>35.01299</td>
</tr>
</tbody>
</table>

Note: Results of Anova test revealed significant difference pre- and post-operation (Wilk's Lambda, estimated F value 6.607, p = 0.016).

**DISCUSSION**

OCAT is a condition of chronic infectious process that is accompanied with obstructive and inflammatory symptoms. Obstruction due to OCAT may result in hypoxia. Hypoxic condition may stimulate monocytes to act more actively, and the activity of bone marrow will increase as well to produce more monocytes. Post-operatively, the hypoxic symptoms may disappear, while monocyte and macrophage counts may also reduce. In addition, the inflammatory process, either due to infection or traumatic process from ATE itself, may stimulate the bone marrow to produce more monocytes. Relieve from hypoxia to non-hypoxic condition may lead to a better oxygenation. This condition may in turn relieve inflammation, that also reduces monocyte and macrophage count. The reduction of monocyte count was proved to demonstrate significant difference (p < 0.05).

**CONCLUSION AND RECOMMENDATION**

OCAT in children who undergo adenotonsillectomy results in significant reduction of monocyte count in 2 weeks post-operatively. ATE procedure to these children is allowed since it improves natural immunity. Serial post-operative study for more than 2 weeks should be carried out to find the course of natural immunity modulation. Other studies involving immunity components that disclose the immunity modulation of Th1 and Th2 should also be carried out in order to have a more comprehensive understanding on the mechanism of adaptive immunity modulation.

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**REFERENCES**


