Mukogawa Women's University
Graduate School of Nursing

Straining and physical effects of different toilet defecation postures

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Of the approved institution in the ethics judgement

Study background

Defecation is one of the basic physiological drives for human being, and indispensible to sustain life activity. Trouble-free defecation is important in order to pass waste material out of body and maintain the healthy body functions, as well as to have daily life comfortably.

Discharge of solid feces cannot entirely rely on forwarding of feces by the bowel peristalses. Upon regular defecation, when you feel a need to defecate, you need to voluntarily strain to utilize Valsalva effect, and with the abdominal pressure, you need to make the intraperitoneal pressure negative to help defecation. This would be accompanied by great changes in circulatory dynamics such as increase of blood pressure and vascular contractions. And as it uses the entire body muscles, it exhausts yourself very much. If you have difficulty in defecation by constipation, besides longer time required for defecation, you need to strain stronger, and defecation could be extremely agonizing. There are also some people who need to avoid such physiological changes as in circulatory dynamics due to their physical conditions. We, thus, thought, as a nursing care procedure, there is a need to study defecation postures that facilitate effective straining with less physical burden (=less burdening straining), and as a consequence, that lead to less-agonizing defecation. In preceding studies, there were comparisons of the intraperitoneal pressures and intra-anal pressures between the squatting posture for Japanese style toilets and the sitting posture for Western style toilets . However, those were report on the difference of strengths of straining in different postures, and did not compare the physical burdens of straining.

Purpose of the study

The aim of this study was therefore to elucidate the straining effects and physical burden of different toilet defecation postures.

Subjects

Twenty healthy women (20.9±0.8 years) with no straining restrictions

Experimental method

1.Procedure: Subjects sat on a portable toilet. In the first test, the subjects sat quietly with their spine at a 90° angle to the sitting surface (basic posture) for 3 min before straining for 8 sec. Thereafter, they rested in the basic posture for 5 min. Next, they sat with their spine tilted 60° to the sitting surface for 1 min before straining for 8 sec. They then returned to the basic posture and rested for 5 min. Measurements were conducted sequentially at different postural angles (45°, 30°) using the same pattern.

2.Measurement items:

1) Electromyography

Electromyography (EMG) was performed to elucidate the differences in the amount of muscle strength used to strain during defecation according to toilet posture. Probes to measure electromyography were attached to

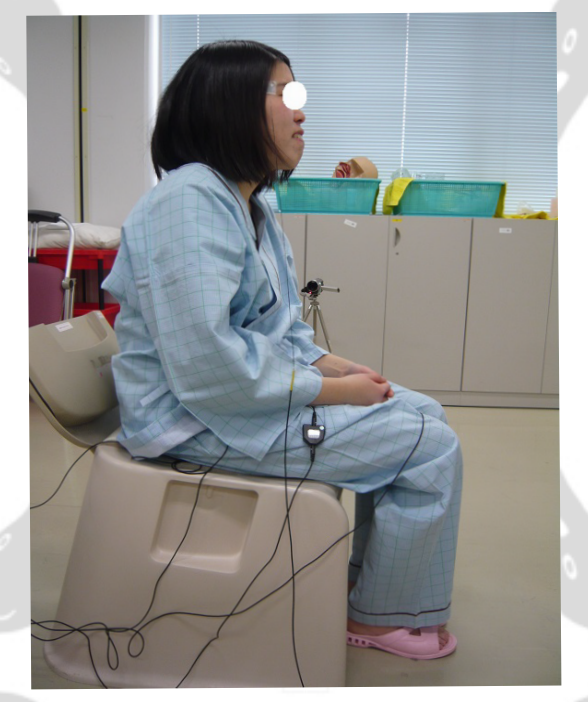
(1)the external oblique muscle
(2)the internal oblique muscle, which are used during straining,
(3)the erector muscles of the spine, which are necessary to maintain posture.

2) Electrocardiography

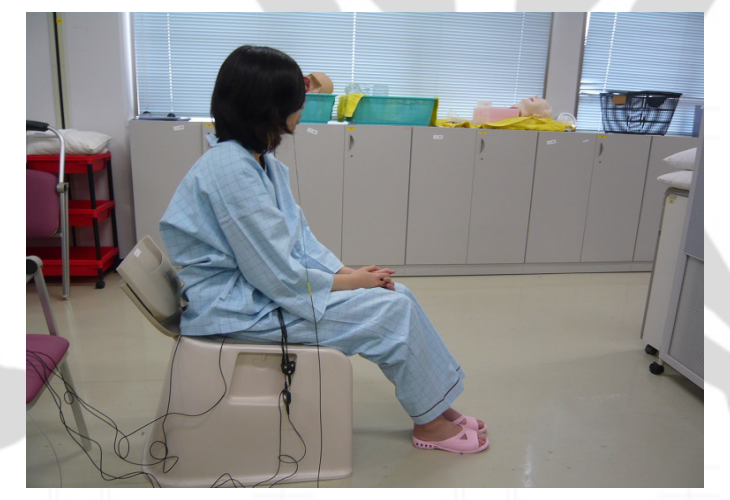
Heart rate variability was measured to determine physical burden during straining.

3) Blood flow

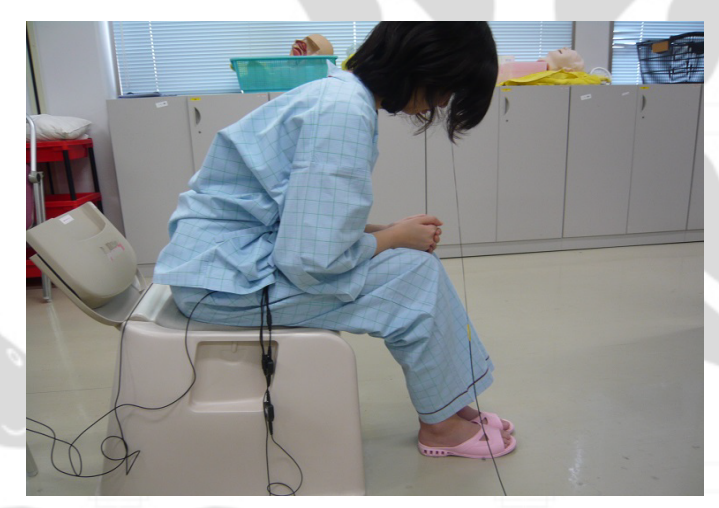
Infrared probes were attached to the lateral sides of the head to measure blood flow as an indicator of physical burden during straining.



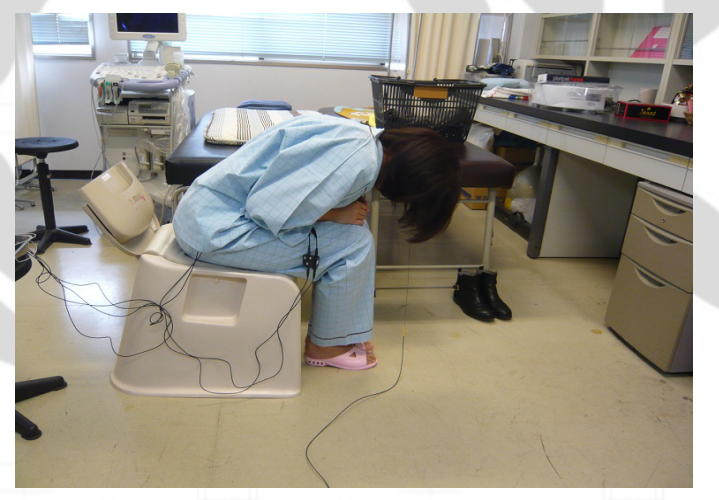
Base90°



60°



45°



30°

Analysis methods

1.Root mean square processing was used to analyze EMG. The integral values extracted during the 3-sec period around the maximum value were used as analysis data. Baseline values at each EMG measurement site before straining for each angle were compared. The Kruskal–Wallis test was used for statistical analysis.

2.The inter-beat interval (IBI) before, during, and after straining was extracted for each angle to be used for electrocardiography (ECG) analysis. The Friedman Test followed by a multiple comparison was used for statistical analyses.

3. For blood flow, data obtained during the 8-sec period before, during, and after straining were extracted. Measured values were converted into integral values and used as analysis data. The Friedman Test followed by a multiple comparison was used for statistical analyses.

The level of significance was set at 0.05 for all tests.

Results

1.Comparison of baseline EMG values for the erector muscles of the spine at 30° and 90° revealed a significant difference ($P = 0.05$). Each postural angle was also compared according to the measurement site, which revealed no significant differences between angles at any of the sites.

2.The IBIs before and during straining at 45° ($P = 0.032$) were significantly different.
A significant difference was also seen between those before and during straining at 90° ($P = 0.032$).

3.Blood flow after straining at 90° was found to have significantly increased as compared to that before straining at 90° ($P = 0.005$). Furthermore, a significant increase in blood flow after straining at 30° was also observed as compared to that during straining at 30° ($P = 0.023$).

Discussion

No change in the amount of muscle strength exerted during straining was found between the different toilet defecation postures tested.

The increase in blood flow after straining is considered to have been caused by a hyperemic reaction after reduced blood flow due to vasoconstriction caused by the burden of straining.

Because this study was conducted in healthy, young subjects, muscle strength may have been exerted more effectively and the resilience tothe burden may have been greater in all toilet postures.

Therefore, a future study will need to investigate a toilet defecation posture that allows effective exertion of strength and reduces thephysical burden in elderly individuals with diminished abdominal muscle strength.

Thank you for your interest in our presentation.

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