The usefulness of newly developed extensible trial neck in total hip arthroplasty

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Disclosure: No benefits in any form have been received or will be received from any commercial party related directly or indirectly to the subject of this article.

INTRODUCTION: Dislocation is one of the greatest complications after total hip arthropathy (THA). Attaining adequate soft tissue tension is very important to prevent dislocation [1]. After placing implants, a surgeon can control the soft tissue tension with the neck length. However, using a trial-and-error method to find the right neck length can be inconvenient for the surgeon as it would require a hip dislocation each time. We have developed a new trial neck device named Multi-trial neck which can help the surgeon adjust the neck length with ease in the surgical field (Fig.1). This device can help avoid the need to dislocate the hip over and over to find the right neck length. The objective of this research was to investigate whether this device could shorten operation time and decrease surgical invasion to the patient.

METHODS: A total of 46 hips of 40 subjects (8 men and 32 women) with a mean age of 72.5 years underwent cementless THA at our institute for osteoarthritis (42 hips), femoral head necrosis (3 hips) and rapidly progressive coxopathy (1 hip). All THA was performed using Kinectiv stem (ZimmerBiomet) with antero-lateral supine approach by a single surgeon. Trial reduction was performed on all subjects at two situations (after cup and femoral rasp were placed and after femoral stem was placed) to compare leg discrepancy and femoral offset with the unaffected side using fluoroscopy and to make sure the hip would not dislocate easily. Subjects were randomly separated into two groups: group M which used the Multi-trial neck during trial reduction and group C which used a conventional trial neck. A Student's t-test was conducted to compare both operative time and blood loss, and Mann-Whitney U test was conducted to compare the number of times an additional dislocation was needed during operation between the two groups. The level of statistical significance was set at $P < 0.05$.

RESULTS: Mean elongation time of Multi-trial neck in group M was 1.3±1.0 times. Mean operative duration was 99±10 min for group M and 115±17 min for group C. Operative duration in group M was significantly shorter compared with group C ($p<0.05$). Mean blood loss for group M was 621±265 ml and 546±193 ml for group C. No significant difference in blood loss was observed between the two groups. Mean additional dislocation times during operation was 0.9±0.9 times for group M and 3.3±1.4 times for group C. Group M required significantly fewer number of dislocations to choose the final neck size compared with group C ($p<0.05$).

DISCUSSION: Mean additional dislocation times during operation in Group M which used the Multi-trial neck proved to be significantly less compared with group C. As a result, the operative time was shorter. This device, however, did not reduce the number of surgical invasions in THA. It is said that leg discrepancy and femoral offset greatly affect clinical and long-term results after THA [1.2]. Both leg discrepancy and femoral offset depend on the selected neck length. In order to determine the neck length, a surgeon must go through the process of attaching a trial neck, trial reduction, evaluation, dislocation and then repeating all the steps with a new trial neck until the correct neck length is determined. This lengthy process can be very inconvenient for the surgeon. Multi-trial neck is a neck that does not require multiple dislocations to assess the proper neck length. From the results of this study, it was revealed that the Multi-trial neck is able to reduce the number of dislocations needed to determine the appropriate length of the trial neck, resulting in a shorter operative time and lessening the burden on the surgeon. It concluded that the newly developed Multi-trial neck is useful in selecting an appropriate neck length in THA. This device can also be very useful for bipolar head arthroplasty with anterior approach. In this procedure, repeated trial reduction and dislocation during operation is quite difficult due to its large femoral head diameter. Trial reduction or dislocation can be performed safely and with ease using this device with neck length setting shorter than aiming length.
The limitations of this study are 1) the device was made with only a straight neck and did not support offset neck as of this moment. 2) the adequate soft tissue tension depends on the individual surgeon's feeling

SIGNIFICANCE/CLINICAL RELEVANCE: The newly developed trial neck device was revealed to be useful in selecting the appropriate neck size promptly.

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IMAGES AND TABLES:

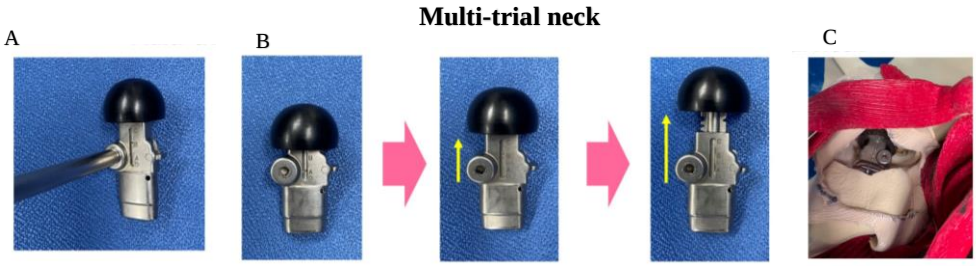

Figure1: Multi-trial neck. (A) Extending Multi-trial neck with driver. (B) Multi-trial neck can be extended to four different neck lengths (size A to D). (C) Multi-trial neck in the operative field.

	Group M	Group C	p value
Mean operative time (min)	99±10	115±17	<0.01
Mean blood loss during operation (ml)	621±265	546±193	n.s.
Mean additional dislocations during operation (times)	0.9±0.9	3.3±1.4	<0.01

n.s. no statistical difference

Table1: Results of operative time, blood loss and number of additional dislocations during operation.