Comparison of femoral nerve potentials during total hip arthroplasty between different surgical positions using transcranial electrical motor evoked potential monitoring.

Wataru Shirahata1, Ryohei Takada1, Naoto Watanabe1, Kazumasa Miyatake1, Ayami Sato2, Kanako Minegishi2, Hideyuki Koga1

1. Department of Joint Surgery and Sports Medicine, Tokyo Medical and Dental University, Tokyo, Japan.
2. Tokyo Medical and Dental University Hospital, Tokyo, Japan.

shirahata.orj@tmd.ac.jp

INTRODUCTION: Femoral nerve palsy after total hip arthroplasty (THA) has a significant impact on patients’ functional prognosis. The purpose of this study is to evaluate the effect of surgical position on intraoperative femoral nerve potentials of THA using an anterolateral entry technique with transcranial electrically stimulated muscle evoked potential (TCE-MEP) monitoring.

MATERIALS and METHODS: Among the primary THAs using the anterolateral entry technique performed at our hospital from April 2020 to January 2023, we included cases in which intraoperative femoral nerve potentials were evaluated by measuring TCE-MEPs. Patient background (age, height, weight, BMI, operative time, and blood loss) was compared between the supine and lateral groups. Intraoperative femoral nerve potentials were evaluated at the beginning of surgery, after anterior acetabular retractor placement, after four acetabular retractors were placed, and before closing the wound. Potentials at the beginning of surgery were considered 100%, and potentials at each time point were compared between positions. Mann-Whitney U test was used for statistics, and the significance level was set at p<0.05.

RESULTS: Measurements were taken in 9 patients in the supine position and 7 patients in the lateral position. There were no significant differences in patient background between the supine and lateral groups, and there was no incidence of postoperative paralysis. The supine group showed a significant decrease in femoral nerve potentials compared to the lateral group at all time points; After anterior acetabular retractor placement (supine 39.6±26.1%, lateral 69.1±24.5%, p=0.015), after four acetabular retractors placement (supine 31.6±29.1%, lateral 67.2±28.9%, p=0.0165), before wound closure (supine 41.1±36.0%, lateral 83.4±36.0%).

DISCUSSION: In this report, we examined the potential changes of the femoral nerve during THA surgery. The supine group showed significantly lower femoral nerve potentials than the lateral group, which was considered to be a risk factor for paralysis.

SIGNIFICANCE/CLINICAL RELEVANCE: Intraoperative nerve potentials were verified using TCE-MEP monitoring during the first THA using the anterolateral entry technique. The supine group showed significantly lower femoral nerve potentials than the lateral group at all time points after anterior acetabular retractor placement, after acetabular retractor placement, and before wound closure.

![Fig.1 Study design](image)

![Fig.2 Surgical Procedure](image)  
(A) Electrodes of hand.  (B) Electrodes of femoral nerve.  (C) Acetabular retractors.  (D) An example of Femoral nerve potential.

![Fig.3 Intraoperative changes of femoral nerve potential](image)