Learning Curve Assessment and Identification of Surgical Pitfalls of a New Hip Prosthesis Using Time-Action Analysis

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ABSTRACT

Outcome measures in hip joint replacement surgery, such as complication rates, are usually rare and require an extensive follow-up. These outcome measure are therefore often inadequate to monitor individual learning curves. We use time-action analysis to determine the level of efficiency of individual steps of a surgical procedure and thereby study the learning curve of surgeons and identify possible pitfalls. By analysing the unedited video recordings of the first 20 procedures of 4 surgeons using sports analysis software, the duration and the number of repetitions of each action during a surgical procedure is measured. This allows the construction of individual learning curves for each surgeon. Actions with a duration of more than the mean + 1sd are identified as inefficient. The video recordings of these actions are reviewed with the surgeon and the possible pitfall and solution is discussed after finalizing all procedures.

Author Keywords

Time action analysis, surgery, learning curve, pitfalls, efficiency, hip prosthesis.

INTRODUCTION

In hip joint replacement surgery, outcome measures like complication rates are rare or require an extensive follow-up. They are therefore often inadequate to monitor individual learning curves. Time-action analysis (TAA) is a tool to objectively determine the level of efficiency of individual steps of a surgical procedure and identify possible pitfalls during a learning curve [1].

METHODS

By analyzing the unedited video recordings of the first 20 procedures of 4 surgeons, the number and duration of the actions needed for a surgeon to achieve his goal and the efficiency of these actions is measured.

We constructed a taxonomy or list of actions which together describe the complete surgical procedure. In the taxonomy we categorized the procedure in 5 different Goal Oriented Phases (GOP):

1. the incision phase.
2. the femoral osteotomy (bone cut) phase.
3. the acetabulum (hip joint socket) phase.
4. the stem phase.
5. the closure phase.

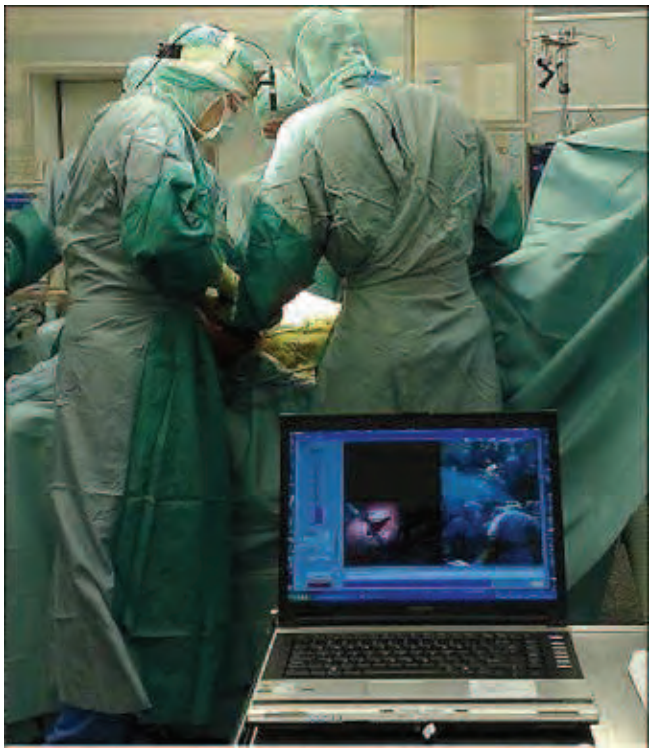

Figure 1. Setup in the operating theatre.

Since the incision phase and closure phase do not differ from the conventional surgical technique we primarily focus on the femoral osteotomy phase, the acetabulum phase and the stem phase.

Each GOP was subdivided in Goal Oriented Actions (GOA) and each GOA is subdivided in Separate Actions (SA) thereby defining all the necessary actions to complete the procedure. We grouped the SAs into GOAs since it would not be feasible to measure each SA.

Using Utilius vs. video sports analysis software (CCC software, Markleeberg, Germany), the duration of each GOA is recorded as well as the amount of delay. Actions

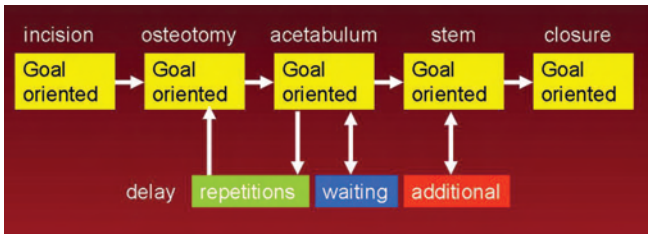

Figure 2. the complete surgical procedure is described by a list of actions, the taxonomy.

with a duration of more than the mean + 1sd are identified as inefficient. The video recordings of inefficient actions are reviewed and the possible problem and solution discussed with surgeons after finalizing all procedures, thereby constructing a list of potential pitfalls.

Ethical Statement

Since this trial is an observational study, a formal ethical approval was waived for this study by the OLVG Medical Ethics Committee. The OLVG Medical Ethics Committee declared to have no objections to this trial.

CONCLUSION

We describe time-action analysis as a method to identify potential problems during the learning curve of a new surgical procedure and to assess the level of efficiency of each surgeon individually.

REFERENCES

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