ABSTRACT

Objectives: Simulation has become an important teaching format in medical education; it is especially useful to teach complex anatomy of temporal bone (TB). We developed a TB simulator to consist of: 1. software with high resolution 3D TB volumetric images. 2. haptic device from which the user can sense the force feedback and the sound of drilling. Aims of this study are to evaluate and to compare the effectiveness of TB simulator in medical student teaching.

Methods: A total of 18 rotating medical students were randomly assigned to the “simulation” (N=13) or “traditional”(N=5) TB training groups. Both groups were oriented with TB anatomy and dissection courses by slide presentation and didactic lecture. The “simulation” group practiced on the simulator to complete 1 session of TB dissection. Written examinations were given at day 0 and day 14. Using paired t-test, the before-after test scores were compared between “simulation” and “traditional” groups.

Results: Both groups showed significant improvement in their comprehension to TB anatomy. The anatomy comprehension showed 18% improvement in “simulation” and 47% in “traditional” group. (P<0.05)

Conclusions: The test results confirm that the 3D, virtual technology, and haptic simulator might be a worthwhile and superior substitute to traditional class-based lecture in teaching TB anatomy.

INTRODUCTION

During the past century, there have been major improvements in patient safety and health care quality and increased complexity of available technical services. Simulation is being used in medical education for multiple specialties including emergency medicine, pediatrics, anesthesia, obstetrics and gynecology, and surgery. The temporal bone is the most intricate and complex structure encountered by otolaryngologists. Although temporal bone laboratories and dissection courses are available for resident training, they may be inaccessible to otolaryngology residents because of geographic distance, scheduling difficulties, and high cost. Alternatives to cadaver temporal bone dissection include plastic and virtual reality temporal bone simulators. The availability of temporal bone simulation has increased because of advances in computer technology and lower costs. Simulation may be used economically in the early stages of learning temporal bone anatomy and surgery, and residents may use the virtual reality temporal bone simulator before participating in cadaver temporal bone dissections. In addition, medical students may use the temporal bone simulator to learn temporal bone anatomy.

METHODS

A total of 18 rotating medical students were randomly assigned to the “simulation” (N=13) or “traditional”(N=5) TB training groups. Both groups were oriented with TB anatomy and dissection procedures by slide presentation and didactic lecture. The “simulation” group practiced on the simulator to complete 1 session of TB dissection. Written examinations to identify the landmarks of temporal bones (zygoma, mastoid, external ear canal, tegmen, sigmoid sinus, incus, lateral-posterior-, and superior-semicircular canal, and facial nerve) were given at day 0 and day 14. Using paired t-test, the before-after test scores were compared between “simulation” and “traditional” groups.

RESULTS (cont.)

The self-evaluation scores of anatomy comprehension revealed 18% improvement in “traditional” group and 47% in “simulation group”. (P<0.05)

Figure 2. Self-evaluation scores

The objective written examination scores showed the “simulation” group had significantly greater magnitude of improvement (69% vs. 7%) than “traditional” group.(P<0.05)

Figure 3. Objective written examination scores

DISCUSSION

The virtual reality system has the advantages of minimal setup, no cleanup, minimal cost, and high daily accessibility and convenience without constraints of clinical schedules. The safe, consistent, predictable, and reproducible materials may decrease time needed for direct supervision. Therefore, the virtual reality simulator may provide an effective, efficient, and economical training program during early stages of learning and may decrease the dependency on cadaver temporal bone to achieve the necessary competency. The incorporation of this simulator in medical education curricula may improve complex anatomic knowledge, especially in programs that have limited access to human cadaver temporal bone specimens.

CONCLUSIONS

The test results confirm that the 3D, virtual technology, and haptic simulator might be a worthwhile and superior substitute to traditional class-based lecture in teaching TB anatomy.

REFERENCES