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The 70-degree telescope as a teaching tool for cleft palate repair and pharyngoplasty surgery☆

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ABSTRACT

Objective: To determine the optimum positioning of a 70-degree telescope to provide a maximum view of the palate and posterior pharynx for observers while minimally obstructing the direct view of a surgeon.
Design: Simulator testing of clinical protocol.
Setting: Simulation center of an academic tertiary care children's hospital.
Interventions: The palate and pharynx of an infant airway mannequin was exposed with a Dingman mouthgag. A 4 mm, 70-degree endoscope was secured to the Mayo stand to provide a projected image of the simulated operative procedure. Various positions of the 70-degree telescope were photodocumented by manipulating the angle of the scope, the extension past the lower lip, and the distance of the scope tip away from the midline. Using a 4-point Likert scale, three surgeons rated the randomized photos from both the direct operative view and the projected endoscopic view.
Results: Average rating for the adequacy of the view for pharyngeal surgery was 2.4/4.0 and for palate surgery was 3.1/4.0 ($p = .001$). Only 4 of 22 scope positions were rated as minimally obstructive to direct view by all three surgeons. Only 1 position – scope parallel and just lateral to the tongue blade – was rated as minimally obstructive and adequate for both pharyngeal and palatal surgery by all three surgeons.
Conclusions: In training centers, a 70-degree telescope attached to a Mayo stand may be useful for teaching and assessing cleft palate and pharyngoplasty surgery, while providing minimal obstruction to direct view by the surgeon.

1. Introduction

The old surgical adage of "see one, do one, teach one" represents a progression from observation to practice and from practice to teaching. In surgical training, when ability to view is limited, then the remainder of the progression of skill transfer, from observation to teaching, ceases. One unique challenge to cleft palate surgery and surgery for the correction of velopharyngeal insufficiency is that the field of view for the primary surgeon is narrow and deep and requires direct illumination and as a result is even more limited for an observer.

In this paper, we discuss a method of using video technology to provide a projected view of the operative field for all members in the room using a 70° telescope secured to the Mayo stand with drape tape.

An ideal method for displaying the operative field would provide an adequate projected view of the surgical field in a manner that does not disrupt the natural flow of the procedure.

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This concept is routinely followed in microsurgical procedures, where the microscopic view may be projected onto a screen so that all personnel in the room can follow the surgical procedure. However, this is not routinely done for surgeries that rely on a surgeon's direct view and not on a microscope or telescope, even when the field of view to the operative field is limited.

Using the method described below, there is a balance between the degree of obstruction to the surgeon's direct view and the quality of telescopic images for observers in the room. To find the ideal position that provides optimal balance between these two competing goals, we evaluated several telescope positions using an infant airway mannequin.

2. Methods

2.1. Clinical use

The patient is placed in suspension with the Dingman mouthgag using towels positioned on the patient's chest. A Mayo stand is brought into position over the patient's chest. A 4 mm, 70° Hopkins-rod telescope (KARL Storz Endoscopy-America, Inc., El Segundo, CA) is placed on 3–4 stacked towels on the Mayo stand and secured with drape tape (Fig. 1). The surgeon performs the procedure in the standard, direct-view fashion without the assistance of the telescopic image.

2.2. Lab testing

A Dingman mouthgag was placed into the oral cavity of a Laerdal Infant Airway Management Trainer (Laerdal, Wappingers Falls, NY). The 70-degree Hopkins-rod telescope was placed and secured in 22 different positions by changing the angle of the telescope, the extension past the lower lip, and the distance of the scope tip away from the midline (Fig. 2). At each of these positions pictures were taken of the direct view from the surgeon's perspective as well as of the resulting telescopic view. These pictures were labeled in a random fashion so that their alphanumeric ordering would remove any corresponding order between the direct view and the telescopic view pictures. They were then distributed to three cleft surgeons at our institution. The surgeons were asked to evaluate the telescopic view for its adequacy for teaching and assessing trainee skills in palate surgery and pharyngeal surgery using a four-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree). A four-point scale was chosen so that there would not be a neutral choice and would force a dichotomous choice between inadequate (1 and 2) and adequate (3 and 4).

Surgeons were also asked to rate the camera position as seen in the direct view for its degree of obstruction to a right-handed surgeon using the same 4-point Likert scale.

The mean of the three surgeon's ratings was calculated for telescopic view and direct view at each camera position. Comparisons were made using chi-square analysis.

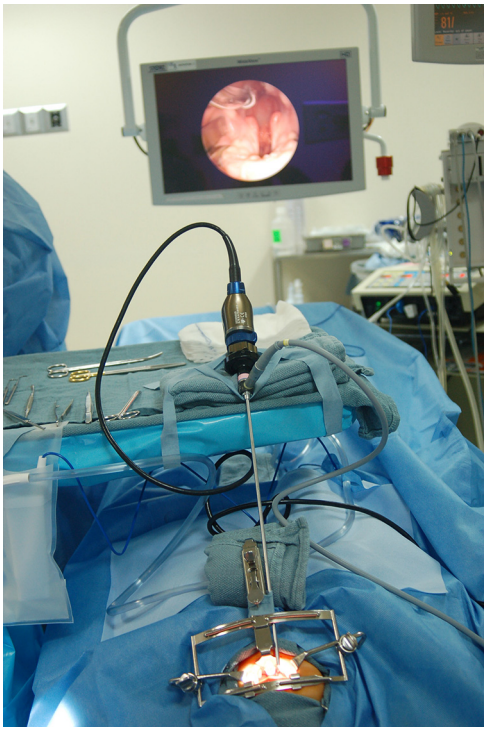

Fig. 1. Typical clinical use for 70-degree telescope for cleft palate repair. The scope is positioned facing inferiorly and the camera is positioned "upside down" in order to provide a surgeon's perspective view of the palate. Drape tape is used to stabilize the scope and camera to the Mayo stand.

3. Results

On average, surgeon raters found the telescopic view to be more adequate for teaching and assessing trainee skills in palate surgery than for pharyngeal surgery. The mean rating for the adequacy of the telescopic view for palate surgery was 3.1/4.0 compared to 2.4/4.0 for pharyngeal surgery ($p = 0.001$). The number of telescope positions out of 22 that were rated as adequate (score of 3 or 4 on Likert scale) by all three surgeons was 17 for palate surgery and 8 for pharyngeal surgery ($p = 0.014$).

Of the 22 positions tested, four were rated as minimally obstructive (score of 3 or 4) by all three surgeon raters. Only 1 position, with the scope just lateral to and parallel to the handle of the mouthgag, was rated as "adequate" and "minimally obstructive" by all three surgeons (Fig. 3).

4. Discussion

Adequate vision of the operative field is essential for skill transfer between teaching surgeon and trainee. A simultaneous view by multiple individuals is a difficult task in cleft palate surgery and pharyngeal surgery. To overcome this hurdle, previous studies have described the use of an endoscope held by an assistant or an endoscope secured to the mouthgag using a specialized clamp [1–3]. In other disciplines with limited surgical views, the use of a headlight camera has been described [4].

Use of a headlight camera offers the advantage of closely aligning the projected image with the surgeon's field of view. However, it requires additional equipment that may not be available, and it may require a physical change of headlights to transition from demonstrating a procedure to supervising a trainee performing the procedure.

A 70-degree telescope secured to the Mayo stand with drape tape utilizes instrumentation that is readily available at most institutions and does not require any special equipment for positioning the telescope, as outlined in previous reports [3]. This arrangement requires only 2–3 min of set-up time and can be completed during the time that the epinephrine injection is allowed to take effect. An additional advantage of this method is that there is no need to change the set-up during the procedure when switching back and forth from teaching surgeon to trainee as is necessary with an assistant holding the telescope or with a headlight camera.

Prior to the described lab testing, our group did attempt to utilize 0-degree, 30-degree, and 45-degree endoscopes intraoperatively