

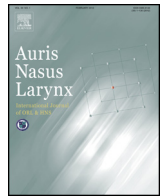


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Guideline

Comparison of pharyngocutaneous fistula closure with and without bacterial cellulose in a rat model

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ABSTRACT

Objective: The present study aimed to compare the effects of bacterial cellulose used for closure of pharyngocutaneous fistulae, a complication of total laryngectomy, with those of primary sutures in a rat model.

Methods: Thirty female Sprague-Dawley underwent experimental pharyngoesophagotomy and were grouped depending on the material used for pharyngocutaneous fistula closure: group I, which received primary sutures alone, group II, which received bacterial cellulose alone; and group III, which received both. After 7 days, the rats were sacrificed. Pharyngocutaneous fistula development was assessed, the gross wound was inspected, and histological examination was conducted.

Results: Pharyngocutaneous fistulae developed in 12 rats (41%) in all: 6 from group I (21%), 4 from group II (14%) and 2 from group III (7%).

Conclusion: Fibroblast density and inflammatory cell infiltration were significantly greater in group III than group I. We concluded that bacterial cellulose may be useful for pharyngocutaneous fistula closure.

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1. Introduction

Pharyngocutaneous fistula (PCF) is the most common complication after total laryngectomy, with an incidence of 3–15% and its prevalence is further increasing with radio- and chemoradiotherapy becoming for treating primary laryngeal cancer [1]. Because PCF is associated with prolonged hospital stay, delayed oral feeding, and delayed adjuvant radiotherapy in some cases, it carries a high morbidity risk, and the costs of treatment are consequently higher. PCF formation is related to

various factors, such as systemic disease, preoperative tracheostomy, and type of pharyngeal closure [2–6]. However, a consensus on the exact factors related to fistula formation has not been reached.

Bacterial cellulose (BC) is a natural polysaccharide with β -(1,4) glycosidic bonds that is produced principally by the genera *Acetobacter*, *Sarcina* and *Agrobacterium*. BC can be shaped and molded easily into desired shapes without loss of its biochemical structure. BC has a high tensile strength, high water absorption capacity, good biocompatibility, and a low host inflammatory response [7], making it a suitable material for use in wound healing. In the present study, we determined whether BC when used as a closure material for PCFs enabled better wound healing than primary sutures alone.

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2. Materials and methods

This study was approved by the Animal Ethics Committee of Marmara University on November 4, 2015, under protocol number “83 .2014. mar.”. It was performed at the Experimental Animal Implementation and Research Centre, with 30 female Sprague-Dawley rats weighing 250–350 g. The animals were housed 4 to each cage with cycles of night and day with standard food and water provided ad libitum.

The rats were anesthetized with a solution of 100 mg/kg ketamine hydrochloride (Ketalar; Eczacıbai, Turkey) and 2 mg of xylazine (Rompun; Bayer, Germany) administered intramuscularly. The neck circumference was shaved and disinfected with ethanol. The rats were placed on the surgical table in the supine position with full head extension, and a 3 cm vertical skin incision was made on the midline of the neck using a No. 15 surgical blade. The thyroid was observed beyond the skin and subcutaneous tissues and retracted laterally, at which point the trachea was seen. The esophagus was observed under the trachea, and a 0.5 cm longitudinal incision was made along its upper part (Fig. 1). Previous studies showed that PCF occurs when the pharyngoesophagotomy is loosely closed while the skin is tightly sutured. PCFs are formed in approximately 3 days after pharyngoesophagotomy in present study [16] (Fig. 2). The rats were divided into 3 groups: in group I, the pharyngoesophagotomy was loosely closed with 3–0 Vicryl sutures, while in group II, it was closed using BC alone. (Fig. 3) In group III, the pharyngoesophagotomy was closed with 3–0 Vicryl sutures followed by BC. In group I and III, pharyngoesophagotomy was closed with only one suture. Standard 0.5 cm BC was spread over to close the pharyngoesophagotomy.

Finally, the skin was tightly sutured using with 3–0 silk sutures (Doğsan, Turkey) in rats from all 3 groups.

Since the oral intake of the rats reduced and they started losing weight, they were subcutaneously administered 5 ml 5% dextrose every morning and evening.

After 7 days, the rats were sacrificed by cervical dislocation. The pharynx and upper esophagus with the larynx were excised



Fig. 2. Formation of pharyngocutaneous fistula at the end of the third day after operation.

and sectioned after fixing in 4% formaldehyde for 24 h, and pharyngeal and esophageal fistulae in the skin were evaluated and macroscopically scored (Fig. 4a, b). Sections were also prepared for histological examination. A pathologist histopathologically scored the pharyngoesophagotomy incision site using the 0–4 Ehrlich and Hunt numerical scale [8,9] in a single-blinded fashion. Inflammatory cell infiltration, angiogenesis, fibroblast proliferation, and collagen deposition were graded from 0 to 4 as follows: 0 = no evidence; 1 = occasional evidence; 2 = light scattering; 3 = abundant evidence; 4 = and confluent cells or fibers.

Data were analyzed using the SPSS software system for Windows (version 16.0; SPSS Inc., Chicago, IL, USA).

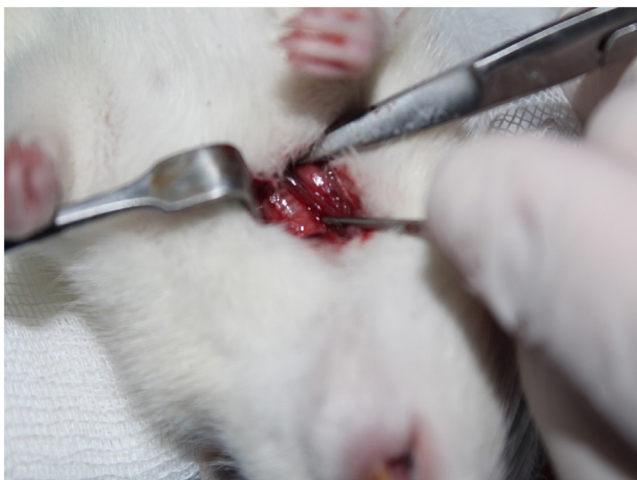


Fig. 1. Pharyngoesophagotomy created with 0.5 cm incision to upper esophagus and closed with 3.0 Vicryl.



Fig. 3. Repairing with bacterial cellulose after pharyngoesophagotomy.

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