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Research Article

MORPHOLOGICAL CHARACTERISTICS OF DAMAGED NECK TISSUE AFTER VARIOUS SURGICAL INTERVENTIONS ON THE LARRYN

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ABSTRACT

The most characteristic etiological factors of damage to the larynx and trachea at present, according to, are intubation, trauma and autoimmune diseases. These types of damage lead to an inflammatory process, which in the larynx and trachea tends to have a primary chronic course, affecting cartilaginous frame, accompanied by persistent infiltration and tissue swelling. Without targeted treatment, such an inflammatory process leads to the development of chondroperichondritis with subsequent atresia of the larynx and cervical trachea above the tracheotomy tube, cicatricial narrowing of the thoracic trachea, persistent impairment of the vocal apparatus and other consequences.

KEYWORDS

larynx, trachea, trauma.

INTRODUCTION

One of the main manipulations used in intensive care units is intubation of the larynx and trachea. For many decades, the only way to ensure free breathing in case of airway obstruction was tracheostomy. However, recent decades have been characterized by the widespread use of endotracheal intubation [9]. The latter began to be used not only for administering anesthesia and providing effective assistance for acute obstruction of the respiratory tract, but also in cases of resuscitation measures requiring long-term artificial pulmonary ventilation (ALV) [5] .

Often carried out in extreme situations to restore adequate breathing, intubation itself is a rather traumatic manipulation for the mucous membrane of the larynx. In this case, quite often, despite observing all the rules for intubation in patients with acute narrowing of the airways, it is necessary to resort to forced insertion, which contributes to the application of excessive efforts to insert the tube into the lumen of the larynx to quickly achieve normal breathing and create adequate oxygenation. As a result, the cricoarytenoid joint, vocal folds, subvocal larynx and trachea are often injured.

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Injury to the mucous membrane and elements of the larynx and trachea during the insertion of an endotracheal tube is confirmed by many works that reflect the results of pathomorphological studies of the larynx and trachea of patients undergoing prolonged intubation [3-5]. In most cases, multiple injuries to the larynx and trachea were detected [2].

In this regard, Grzonka MA , Kleinsasser O. Based on the pathomechanisms of intubation, they even identified types of damage after intubation, which they classified as: inflammatory reaction of the mucous membrane, damage to the larynx by intubation, as well as damage as a result of ballooning of the endotracheal tube. To prevent possible complications, the authors suggest conducting a gentle endoscopic examination of the larynx and trachea, at least after each forced or prolonged intubation.

At the same time, G.G. Aslanyan et al. found that the frequency of development of intubation injuries of the larynx is influenced by the constitutional variant of the physiological angle between the larynx and trachea, as well as age-related differences in the topical concentration and activity of H2 and B2 receptors in the submucosal layer of the subglottic region of the larynx and trachea.

At the same time, in the scientific literature of recent years there have been reports of a decrease in the level of post-intubation complications, which is associated with improvements in the design and material of endotracheal tubes, as well as a large number of manuals for the management of intubated patients [1]. Thus, [7] noted only 15 cases of post-intubation stenosis over the ten-year period of operation of the department.

However, as practice shows, damage to the larynx and trachea during intubation occurs more often than is commonly believed [10]. For every 100 intubations, there are about 20-50 cases. DIAstrachan et al. in 1998 conducted research on complications associated with intubation. Of the 52 patients, complications were identified in 57%. During intubation, especially long-term or repeated, injuries to the mucous membrane were discovered and, as a result, intubation granuloma, scars and cicatricial membranes of the larynx and trachea. Most are the result of prolonged pressure from the tube cuff on ischemia-sensitive airway structures. If the effect on tissue exceeds capillary arterial pressure (approximately 30 mm Hg), ischemia occurs, followed by inflammation, granulation and stenosis. Inflating the cuff with a minimum volume (no more than 20 mm Hg) reduces blood flow in the tracheal mucosa by 75%; greater inflation leads to a complete cessation of blood flow, and as a result, to tubular damage, which is aggravated by the addition of a secondary infection.

The negative impact of the inflatable cuff on surrounding tissues has been confirmed by studies [11]. Against the background of ischemia and hypoxia of the mucous membrane and cartilage of the trachea, dystrophic and then necrotic changes develop in them, which in some patients lead to cicatricial stenosis or chondromalacia [6].

Results. Treatment of patients with inflammatory pathology of the larynx and trachea has a whole range of unresolved issues. Currently, there is no consensus regarding both the most optimal methods of conservative ¬therapy and the timing of subsequent reconstructive operations on the larynx and trachea after acute inflammation or injury.

In this regard, to objectively substantiate the rational timing of surgical treatment of inflammatory stenotic processes of the larynx and trachea, and drug ¬treatment regimens, it is necessary to conduct a study

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to determine the degree of damage to organs and tissues of the neck.

In light of the above, we conducted an experimental study in rabbits, the purpose of which was to study the morphological changes in the mucous membrane and elements of the larynx and trachea in the dynamics of the pathological process after damage to these organs.

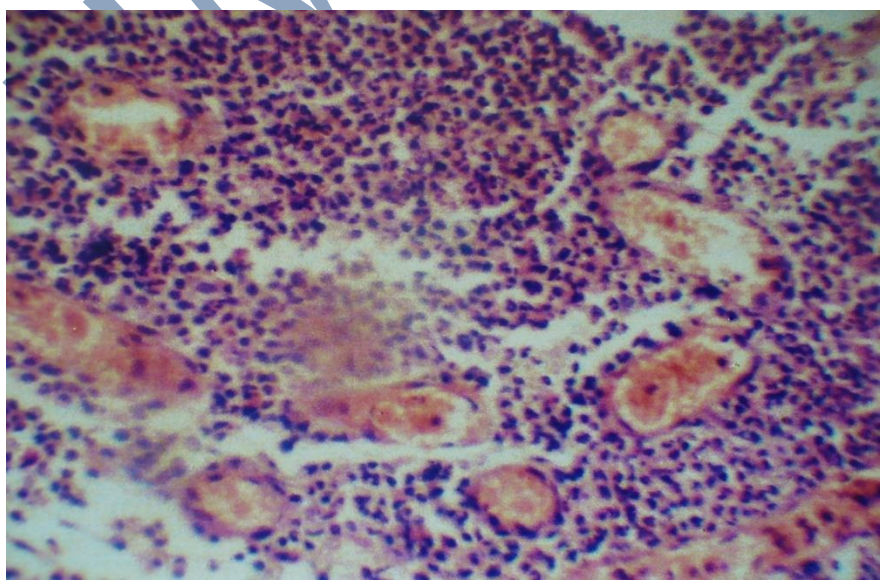
As shown in the section "Materials and research methods," all rabbits, depending on the surgical methods, were divided into 3 groups.

The condition of 15 experimental animals was monitored in a vivarium daily. It should be noted that in a number of animals, as a rule, on days 7-10 and later, spontaneous closure of the stoma lumen was noted with deterioration in breathing, accompanied by noise. In such cases, we took measures to restore breathing.

According to the tasks set, the surgical material was studied ¬in each group of animals, followed by a morphological assessment of the changes occurring from the moment after the surgical intervention.

The most significant changes were observed in scars excised ¬from the lumen of the larynx and trachea in rabbits of the first and second groups. At the same time, the tissue of the larynx and trachea in rabbits with a short period of study was characterized by the usual picture of early inflammation. In animals of the first and second groups, granulation tissue was characterized by dense infiltration of lymphohistiocytic elements, the density of which was highest ¬in the deeper sections. Along with this, in areas with a high content of cellular elements and edema, a large number of vertically oriented vessels in a state of stagnant plethora with a wide lumen and thin walls were noted (Fig. 1).

Among the cellular elements of the stroma, neutrophilic leukocytes and a small number of macrophages predominated ¬; in the deeper layers, the content of macrophages increased, and fibroblasts appeared. Fibrinoid deposits and oriented blood vessels were detected in the stroma (Fig. 2).



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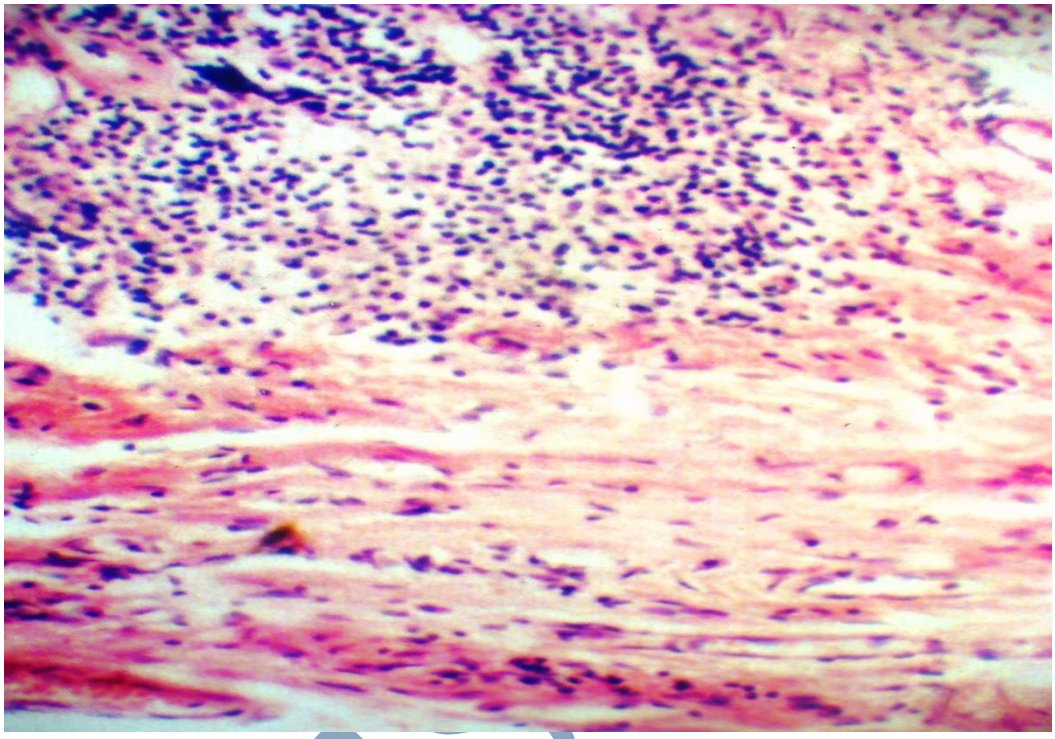
Rice. 1. Dense lymphohistiocytic infiltration of the stroma with the presence of many blood-filled vessels with a wide lumen. Hematoxylin and eosin. Uv. 200x



Rice. 2. The presence of neutrophilic leukocytes, fibrinoid deposits and oriented vessels with thin walls in the granulation tissue. Hematoxylin and eosin. Uv. 100x

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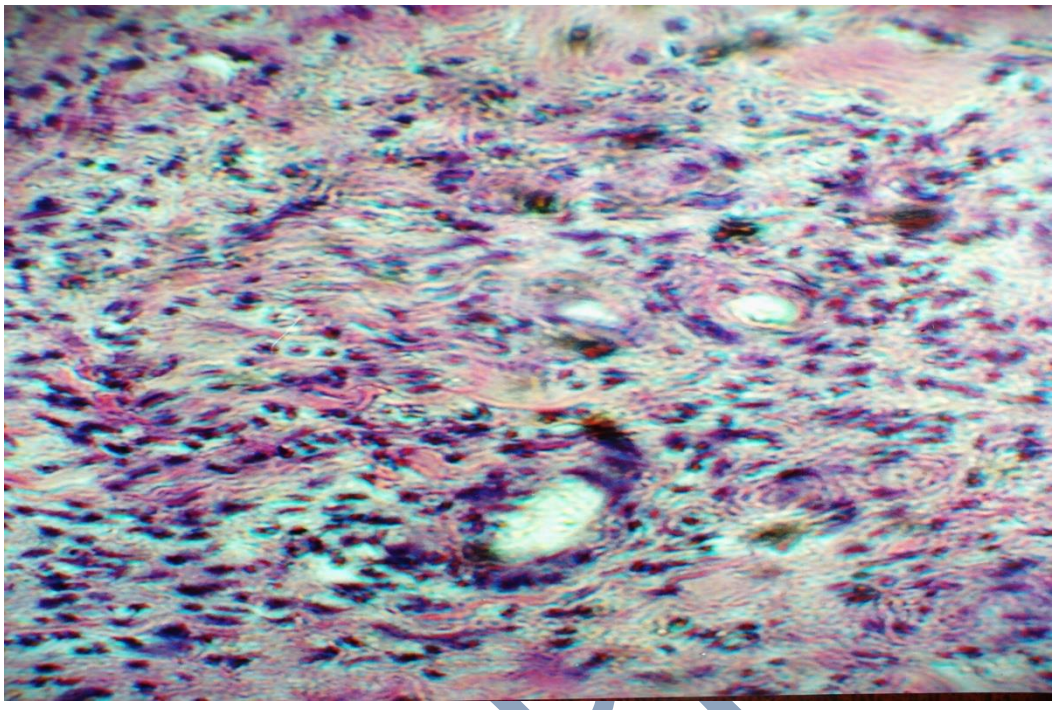
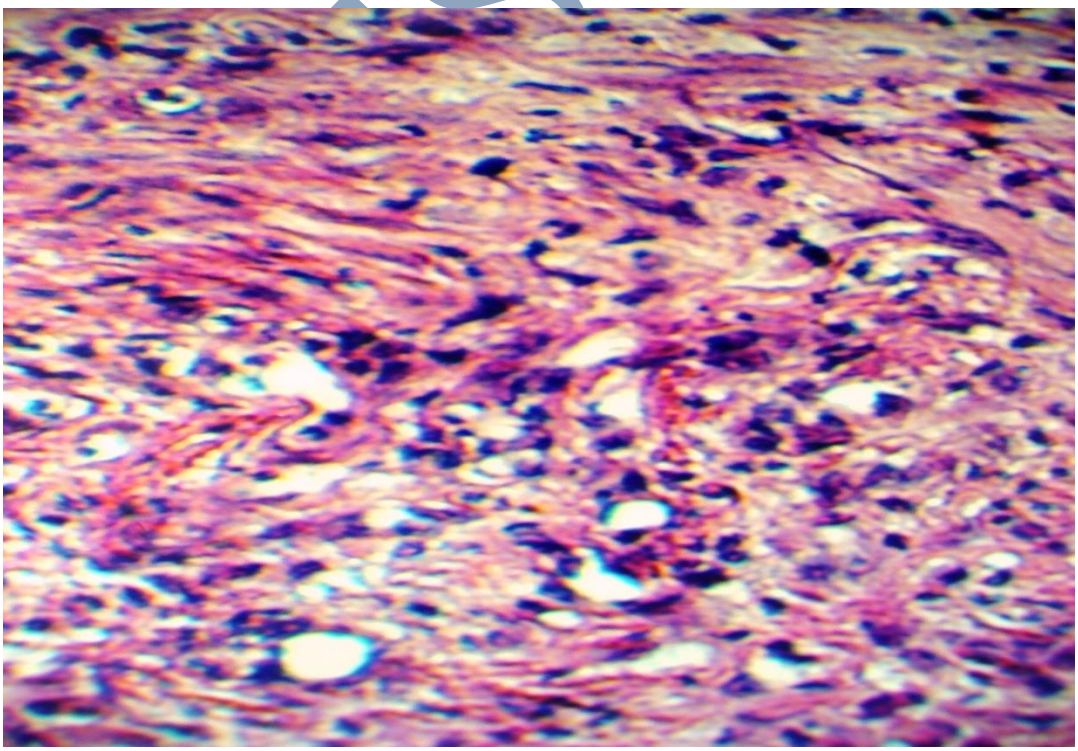


Rice. 3. The stroma is infiltrated with various cellular elements (lymphocytes, macrophages) with areas of fibrosis. Hematoxylin and eosin.. UV. 200x



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Rice. 4. Foci of scarring in the submucosal layer with accumulations of cellular elements and many vessels. Hematoxylin and eosin.Uv. 200x

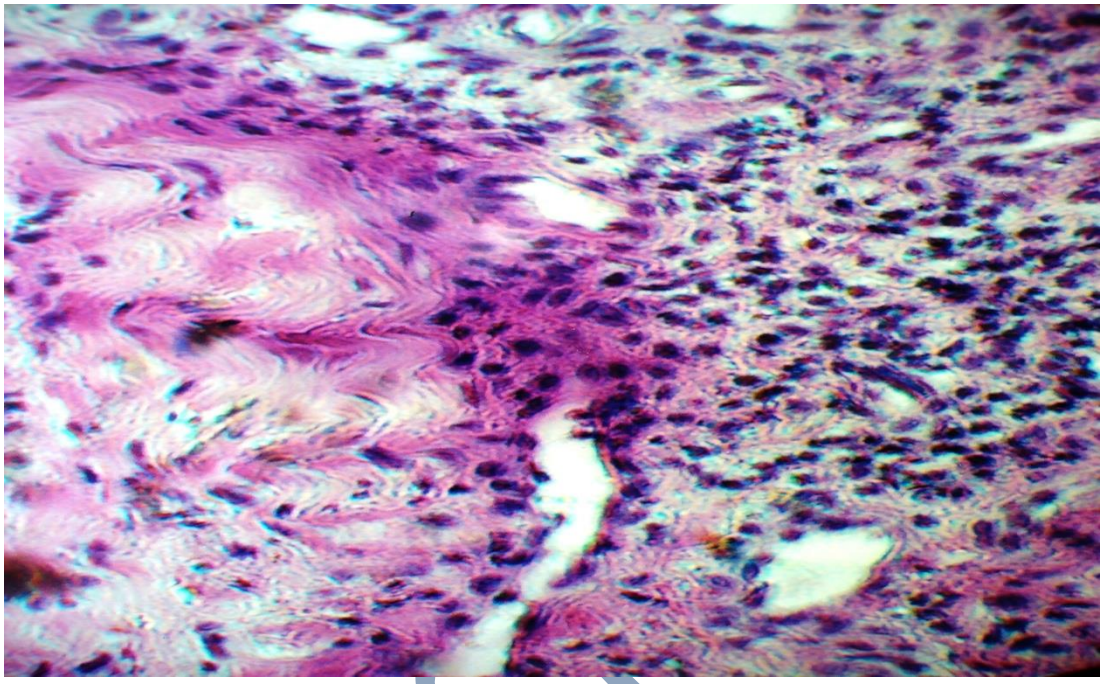

Figure 5. Accumulation of various cellular elements of the lymphohistiocytic series. On the left is scar tissue represented by coarse fibrous connective tissue. Hematoxylin and eosin. Uv. 300x

In animals with the final stage of the inflammatory process, the defect area consisted of connective tissue rich in various ¬cellular elements, which were represented mainly by lymphocytes, macrophages and single plasma cells. Foci of fibrosis were observed between areas of granulation tissue (Fig. 3). The vessel walls were infiltrated with lymphocytes

In animals with chronic productive inflammation, intercellular interstitial edema and focal accumulations of lymphoid-histiocytic elements were observed in the removed piece.

In the submucosal layer, foci of scarring were identified, between which cellular elements and vessels with an expanded lumen were identified (Fig. 4).

Analyzing the results of a morphological study of the tissues of the -damaged larynx, we came to the conclusion that during the formation of persistent deformations of the respiratory tract in the early post-traumatic period, a residual (32%) or chronic productive (68%) inflammatory process took place in the internal structures of the larynx and trachea.

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In the long term, in a number of rabbits (41%), against the background of fibrosis, chronic inflammation continues in the formed scar, as evidenced by the accumulation of various lymphohistiocytic elements (Fig. 5). In most ¬cases, during these periods, the scar is represented by coarse fibrous tissue, which, however, has a tendency to further restructuring ¬due to the preservation of lymphoid infiltrates around the vessels.

The outer layers of the cartilaginous skeleton of the larynx and the external muscles in the early period after injury in animals of the third group had significantly less pronounced inflammatory ¬changes. In the later stages, in these areas, against the background of moderate fibrosis, preservation of the structure of muscle and cartilage tissue with the presence of cambial cellular elements was also noted. The skin adjacent to the edges of the tracheostomy was subjected to sclerosis in the dermal layer with a general decrease in the elements of the microvasculature (small-caliber vessels and capillaries).

CONCLUSIONS

Summarizing the results of morphological studies of surgical material, we came to the conclusion that the outer layers of the cartilaginous frame of the larynx and trachea, as well as the external muscles, are least susceptible to destruction and vascular changes. Moreover, these qualities are detected ¬already in the early stages after the elimination of the clinical symptoms of the inflammatory process in the tissues of the neck. The skin lining of the edges of the stoma, both in the early and late periods, loses some of the elements of the microvascular tract and partially loses the structure of the subepidermal mesh layer against the background of progressive fibrosis of the dermis. The internal structures of the respiratory tube in the early period after injury are characterized by an increased regenerative ability of the submucosal connective tissue, with a tendency to degradation and resorption of the underlying cartilage. Moreover, in the early stages after the clinical signs of inflammation have subsided, microscopically in this area there is often an abacterial stage of productive inflammation with a tendency to become chronic. In the later stages, the scar regenerate formed in the submucosal area, in most cases, also does not lose the ability to undergo further restructuring, since it has paravascular ¬foci of young connective tissue cells.

From this point of view, in order to successfully eliminate chronic inflammatory stenotic processes and volumetric defects of the framework of the larynx and trachea in a clinical situation, it is necessary to reduce the proliferative activity of the submucosal layer of the connective tissue of the larynx and trachea in order to ensure the best ability for engraftment and regeneration. The search for ways to reduce the inflammatory response in response to various etiological factors affecting the larynx and trachea will be discussed in the following sections.

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