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**UNIVERSITY OF MEDICINE AND PHARMACY
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***Clinical and therapeutic study on hemorrhagic
emergencies in cervico-facial pathology***

SUMMARY OF THE DOCTORAL THESIS

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Fundamental Problem

Cervico-facial hemorrhagic emergencies represent a pathology of significant importance due to their clinical repercussions, morbidity, and mortality, which are inversely proportional to the speed of reaction and implementation of optimal treatment. The management of these medico-surgical entities requires multidisciplinary teams, including emergency medicine specialists, otorhinolaryngologists, oral and maxillofacial surgeons, and intensive care specialists, depending on the location and severity. The selection of this research topic was motivated by the increased frequency of life-threatening cases, the diagnostic challenges, and the management of these pathologies, as well as the need to update intervention protocols. The importance of the topic stems from the severe potential of the studied pathologies, which can rapidly lead to serious complications or death if intervention is not prompt and effective.

Hypothesis

The working hypothesis is that an integrated diagnostic and therapeutic approach, based on a systematic analysis of clinical cases encountered in the clinic and specialized literature, can contribute to improving the management of cervico-facial hemorrhages and reducing associated complications.

Objectives

The main scientific objectives of this research include:

- **Identification and Classification:** To identify and classify the main types of hemorrhagic emergencies encountered in cervico-facial pathology, emphasizing etiology, frequency, and clinical presentation.
- **Diagnostic Strategies Analysis:** To analyze diagnostic strategies used in hemorrhagic emergencies, including the role of imaging techniques (CT, CT angiography, Doppler ultrasound, MRI, etc.) for early and accurate diagnosis.
- **Therapeutic Methods Evaluation:** To evaluate therapeutic methods applied in the treatment of these pathologies from the specialist's perspective, considering the anatomical peculiarities of the head and neck region, comparing the efficiency of surgical interventions

with other non-surgical hemostatic therapies and the efficiency of classic surgical interventions with minimally invasive approaches like endoscopic surgery or embolization.

- **Correlation Establishment:** To establish correlations between risk factors, the type of vascular lesion, and the clinical evolution of patients, to identify predictive elements for complications or unfavorable outcomes.

- **Recommendation Formulation:** To formulate recommendations for optimizing the management of cervico-facial hemorrhagic emergencies, which should improve the standardization of therapeutic approaches and patient prognosis.

Research Methodology

The research employed a mixed-methods approach, combining retrospective analysis of clinical data with case studies, statistical correlations, and the application of a prospective protocol. The study was conducted at the "Prof. Dr. D. Hociotă" Institute of Phonoaudiology and Functional ENT Surgery in Bucharest, a tertiary ENT center, over a five-year period (January 2018 – December 2022).

Patient Population: A total of 624 patients who presented to the emergency department with vascular affections localized in the cervico-facial region between January 2018 and December 2022 were included.

Inclusion Criteria:

- Hospital admission diagnoses such as epistaxis (R04.0), acute tracheitis (J04.1), neck hemorrhage (R04.1), hemorrhage of other parts of the respiratory tract (R04.8), unspecified respiratory tract hemorrhage (R04.9), other specified hemorrhagic conditions (D69.8), benign rhinopharyngeal tumor (D10.6), unspecified carotid artery injury (S15.0), common carotid artery injury (S15.01), traumatic injury of blood vessels with unspecified body localization (T14.5).

- Patients hospitalized in continuous regimen.
- Age over 10 years.
- Complete medical data available (for the retrospective part) and informed consent (for the prospective part).

Exclusion Criteria:

- Patients under 10 years of age.
- Incomplete or inconclusive medical information.
- Otorhinolaryngological pathology not involving bleeding in the cervico-facial region.

Analyzed Variables: Included age, gender, hospitalization period, main and secondary diagnoses, biological and paraclinical investigations, imaging investigations, localization and nature of the vascular lesion, triggering mechanism of hemorrhage (trauma, iatrogenic complications, spontaneous, tumoral), administered medical treatment, applied surgical treatment, and personal medication impacting coagulation.

Statistical Analysis: Data were analyzed using IBM SPSS Statistics 25 and illustrated with Microsoft Office Excel/Word 2024. Quantitative variables were tested for normal distribution using the Shapiro-Wilk test and expressed as means $\pm$ standard deviations or medians with interquartile ranges. Non-parametric quantitative variables were tested between groups using the Mann-Whitney U test. Qualitative variables were presented as numbers or percentages and tested using Fisher's exact test, with Bonferroni correction for detailing results in contingency tables. The significance level was set at $\alpha = 0.05$.

Synthesis of Chapters**I. General Part: Current State of Knowledge****1.1. Hemostasis: Essential Aspects for Clinical and Surgical Studies**

Blood, comprising plasma, red blood cells, leukocytes, and platelets, constitutes about 8% of an adult's total weight²⁰. Large blood losses lead to pathological scenarios, tissue damage, and increased mortality risk, causing hypothermia, coagulopathies, infections, acidosis, and multiple organ failure. Patients with cancer (due to chemotherapy/radiotherapy induced bone marrow suppression and vascular wall changes), those on anticoagulant treatment, and patients with hematological pathologies (coagulation factor deficiencies, platelet dysfunction) have an increased bleeding risk. Hemostasis, meaning "stopping of blood," is a physiological process maintaining blood vessel integrity and preventing excessive blood loss. It involves three main phases:

1. **Vasoconstriction:** Immediate vessel contraction to reduce blood flow.

2. Platelet Plug Formation: Platelets aggregate at the injury site to form a temporary barrier.

3. Coagulation: Plasma proteins, like fibrinogen, activate to form a fibrin mesh, permanently sealing the lesion. Paul Morawitz's 1905 model clarified coagulation mechanisms in four steps: thromboplastin release, prothrombin activation to thrombin, fibrin formation, and clot stabilization. Later, additional coagulation factors were identified, forming a complex cascade. This process, starting with vasoconstriction, platelet adhesion (primary hemostasis), and activation of coagulation factors (secondary hemostasis), ensures bleeding cessation.

1.2. Classification of Hemorrhages in the Cervico-Facial Region

Hemorrhages are classified by severity and systemic impact:

- **Class I (<15% blood volume loss):** Usually asymptomatic, normal vital signs, managed with oral/intravenous hydration.
- **Class II (15-30% blood volume loss):** Moderate anxiety, mild tachycardia, pallor, thirst, managed with intravenous fluids and careful monitoring.
- **Class III (30-40% blood volume loss):** Severe symptoms, hypotension, significant tachycardia, tachypnea, marked anxiety/confusion, cold sweats; requires blood transfusions and immediate intravenous solutions.
- **Class IV (>40% blood volume loss):** Critical state, marked hypotension, rapid/weak pulse, rapid/shallow breathing, anuria, lethargy, loss of consciousness; requires emergency medical intervention, massive transfusions, and surgical control.

Hemorrhages in the ORL sphere are classified by location:

Nasal Hemorrhages: Anterior (Kiesselbach's plexus) and posterior (larger vessels) epistaxis, bleeding from nasopharyngeal angiofibroma, naso-sinusal tumors, cavum tumors, and complex cranio-facial post-traumatic bleeding.

Pharyngeal Hemorrhages: Less common, from tonsillar tumors, post-tonsillectomy bleeding, oropharyngeal cancer, base of tongue cancers, and oro-mandibular trauma.

Laryngeal/Tracheal Hemorrhages: Rare but severe, from malignant laryngeal tumors, subglottic hemangioma, intracordal hemorrhages, post-toxic inhalation hemorrhages, retrocricoid/esophageal mouth hemorrhages (in cirrhotic patients).

Cervical Hemorrhages: From thyroid gland, large neck vessels, lymph nodes, or cervical muscles; from trauma, metastatic tumors, during/after tracheotomy, or after oncological resections.

Tegumentary Hemorrhages: In malignant tumors like basal cell carcinoma, melanoma, Rendu-Osler-Weber syndrome, or Kaposi's sarcoma.

Systemic Causes: Vasculopathies (HTA, atherosclerosis, HHT), internal carotid artery aneurysm, cardiopathies (mitral stenosis), pulmonary diseases (chronic hypoxia, pulmonary hypertension), superior vena cava compression syndromes, renal diseases (uremia), hepatic affections (cirrhosis), coagulation disorders (thrombocytopenia, von Willebrand, hemophilia), anticoagulant medications, vitamin deficiencies (K, C), hematological diseases (leukemia, severe anemia).

Lifestyle Factors: Excessive alcohol consumption, drug use (cocaine, injectables, inhalants), and extreme temperature exposure.

Particular Clinical Entities: Diffuse intra/postoperative hemorrhages (e.g., in FESS), Hereditary Hemorrhagic Telangiectasia (Rendu-Osler-Weber disease), Kaposi's Sarcoma, Juvenile Nasopharyngeal Angiofibroma, and congenital/acquired vascular malformations like arteriovenous fistulas and aneurysms.

1.3. Etiopathogenic Mechanisms in Cervico-Facial Hemorrhages

Local causes include **trauma** (nasal trauma, road accidents, heteroaggressions, craniofacial fractures, cervical contusions, ingestion of sharp objects). **Iatrogenic trauma** from medical procedures (nasogastric tube insertion, nasotracheal intubation, central venous catheterization, peritonsillar abscess drainage, tonsillectomy, biopsies, rhinological surgeries like turbinoreduction/septoplasty, tracheostomy, prolonged intubation). **Intranasal foreign bodies and rhinolithiasis** cause inflammation and bleeding. **Particular anatomical situations** like arterial aneurysms, arterial dissections, septal deviations, and pharyngeal/laryngeal varices. **Nasal mucosa** is highly vascularized, with anastomoses between internal and external carotid systems (Kiesselbach's plexus/Little's area is the most frequent source of anterior epistaxis). Posterior nasal bleeding often involves the sphenopalatine artery. The thin mucosa and lack of muscular barrier contribute to fragility⁷⁰. **Vocal cords** are specialized, exposed to intense mechanical stress. Their rich capillary network in Reinke's space is vulnerable to microtrauma and sudden pressure changes. Vascularization comes from superior and inferior laryngeal arteries, forming fine anastomoses. The "functional avascular zone" relies on diffusion, making it prone to

microhemorrhages from phonotrauma. **Inflammation and infections** (rhinosinusitis, allergic rhinitis, granulomatosis, sarcoidosis, tuberculosis, tonsillitis, hemorrhagic tracheitis, cervical abscesses, mediastinitis) increase local vascularization and bleeding risk. **Tumors** (malignant and highly vascularized benign ones like Juvenile Nasopharyngeal Angiofibroma) are major etiologies. Angiofibromas, despite being benign, are highly vascular and cause massive bleeding. Malignant tumors often cause bleeding due to neoangiogenesis and secondary to chemo/radiotherapy effects (bone marrow suppression, vascular wall fibrosis). **Environmental factors** (humidity, atmospheric pressure, temperature differences) contribute to nasal bleeding. Prolonged use of **nasal decongestants** leads to mucosal damage, ischemia, necrosis, and rebound vasodilation, increasing capillary fragility. **Systemic causes** include arterial hypertension, vasculopathies (Rendu-Osler-Weber disease), cardiopathies (mitral stenosis), pulmonary pathologies, renal insufficiency, hepatic insufficiency, coagulation disorders, and anticoagulant/antiplatelet medications.

1.4. Current Data on Techniques and Technologies for Controlling Cervico-Facial Bleeding

1.4.1. Hemostatic Biomaterials and Technologies for External Applications: Used for open wounds. Topical hemostatics are organic (natural derivatives like cellulose, starch, dextran, alginate, chitosan, keratin; biological derivatives like collagen, thrombin, gelatin; synthetic sources) or inorganic (zeolite, kaolin). They come as bandages, dressings, foams, gels, or intracavitary forms.

- **Cotton-based materials** (gauze, oxidized cellulose, regenerated oxidized cellulose, carboxymethyl cellulose hydrogel) absorb blood, trigger coagulation, and maintain a moist wound bed.

- **Collagen-based materials** (bovine purified collagen, sponges) promote platelet adhesion, activation, and aggregation, speeding up clot formation.

- **Composite sprays** (e.g., CoStasis, with bovine collagen, thrombin, autologous plasma) are effective for external administration.

- **Gelatin-based materials** (GelFoam, Gelaspon, FloSeal, GRF) induce platelet activation and aggregation, strengthen clots, and offer mechanical hemostasis.

- **Alginate-based technologies** (Alosteril) utilize negative charges to capture calcium ions, essential for coagulation.

- **Chitosan-based materials** (TraumaStat, HemCon, ChitoFlex, Celox) are positively charged, interacting electrostatically with red blood cells to cause agglutination and cover the bleeding site.

- **Zeolite and kaolin powder-based materials** (QuikClot, WoundStat) absorb water, concentrate coagulation factors, release calcium ions, and activate factor XII.

- **Blood-derived/recombinant factor hemostatics** (fibrin glues/adhesives, fibrin fibers, autologous plasma sealants) are widely used in surgery, forming fibrin *in situ*.

- **Synthetic-derived hemostatic materials** (polyamino acids like polylysine, polyarginine, polyethylene oxide, polypropylene oxide polymers, PEG, acrylamide polymer gels) enhance fibrin/thrombin production, delay fibrinolysis, or provide mechanical sealing.

- **Combined systems** leverage multiple technologies for superior hemostatic effects.

1.4.2. Hemostatic Materials and Technologies for Intracavitary Applications:

Used for abdominal hemorrhages, e.g., FloSeal, fibrin foam, compressed plant-extracted cellulose sponges covered with chitosan.

1.4.3. Hemostatic Materials and Technologies for Intravenous Applications:

Aim to improve survival in abundant hemorrhage.

- **Natural pro-coagulants:** Cryoprecipitate (fibrinogen, von Willebrand, factor VIII, factor XIII), fresh frozen plasma (rich in prothrombin, factors II, V, VII, IX, X).

- **Recombinant factors:** Kogenate, ADVATE, Recombinate, Refacto (factor VIII), BeneFix (factor IX), factor VIIa.

- **Synthetic pro-coagulants:** Silicon particles coated with polyphosphate polymers, increasing thrombin production and stabilizing fibrin clots.

- **Clot resistance/stability enhancers:** Tranexamic acid (synthetic antifibrinolytic agent) reduces blood loss and transfusion needs.

- **Vascular embolization:** Catheter-based application of metallic coils or liquid synthetic polymers (Onyx) to stop internal bleeding.

- **Platelet-derived/mimicking biomaterials:** Transfusions with platelet concentrate, or synthetic platelet systems like SynthoPlate.

II Personal Contributions

2. Clinical and Therapeutic Study of Hemorrhagic Emergencies in Cervico-Facial Pathology

This part details the clinical study conducted to address the objectives.

• **2.3. Results** The study analyzed 624 patients from January 2018 to December 2022. Patients were grouped into nasal hemorrhages (epistaxis), tracheal hemorrhages (acute tracheitis), pharyngo-laryngeal and laterocervical hemorrhages, and juvenile angiofibroma cases.

◦ **Epistaxis:** Out of 1173 patients presenting with nasal bleeding, 260 (22.22%) required hospitalization.

▪ **Patient Characteristics:** Mean age 54.95 ± 18.06 years (median 55.5), with 60% males. Mean hospitalization 6.55 ± 3.15 days (median 6). Mean hemoglobin 11.58 ± 2.7 g/dl.

▪ **Comorbidities:** 63.8% had hypertension, 43.5% cardiovascular history, 11.9% diabetes, and 46.9% were on anticoagulant therapy.

▪ **Bleeding Characteristics:** 71.9% had recurrent epistaxis, 22.3% bilateral, and 15.4% post-operative. 14.2% had a history of oncological conditions. Most were anterior (49.6%), with 44.6% classified as severe.

▪ **Treatment:** Most treated with anterior nasal packing (49.6%) or electrocautery (28.8%).

▪ **Correlations:** Longer hospitalization (≥ 7 days) was significantly associated with ages 35-65 (46.8% vs. 23.8% for <35 years) and recurrent epistaxis (45.5% vs. 31%). Anterior epistaxis was associated with shorter hospitalization (<7 days: 58.3% vs. 37.4%), while electrocautery was more common in longer stays (38.3% vs. 21.9%). Severe epistaxis led to longer hospitalization (58.9% vs. 34.4%) and lower hemoglobin levels (median 10.4 vs. 12.5 g/dL). Recurrent epistaxis was more spontaneous than post-operative (80.5% vs. 25%) and significantly associated with oncological pathologies (89.2% vs. 69.1%). Electrocautery was more used in recurrent cases (34.2% vs. 15.1%). Severe epistaxis was associated with cardiovascular pathologies (52.2% vs. 38.8%) but less with oncological

conditions (27% vs. 47.5%). Severe epistaxis was primarily posterior (32.8% vs. 6.9% for non-severe) and treated with electrocautery (54.3% vs. 8.3% for non-severe).

- **Juvenile Nasopharyngeal Angiofibroma:** 10 male patients were diagnosed, with a mean age of 16.2 years (range 11-28). All presented with recurrent epistaxis, nasal obstruction, and facial pain/headache. The average delay from symptom onset to first medical check-up was 6.7 months, and to surgery, 9.5 months. All underwent CT and/or MRI and were staged using the Radkowsky classification (IA-III A)¹⁶¹. All were surgically treated (9 endoscopic transnasal, 1 combined approach) 24-48 hours post-embolization¹⁶¹. Most cases were IIA (30%) or IIC (30%). The most common vascular source was the left internal maxillary artery (50%) or bilateral (40%). Only one case experienced recurrence (9 months post-surgery), requiring reintervention, this patient had the most arterial sources.

- **Acute Tracheitis:** 203 patients, all with tracheal cannulas, were included. Mean age was 62.59 ± 9.29 years (median 63), with 59.1% aged 35-65 and 40.4% over. Most cases occurred in March, January, April, and November. Mean hospitalization was 5.45 ± 4.53 days (median 5), with 61.1% hospitalized <7 days. Bleeding was spontaneous (47.3%) or due to respiratory viruses (30.5%). A vast majority (86.2%) had oncological pathologies. Most bleeding stopped spontaneously (73.4%), with 26.6% needing intravenous hemostatics. Only 5.4% developed anemia.

- **Pharyngo-Laryngeal and Laterocervical Hemorrhages:** 161 patients, mean age 51.2 ± 17.14 years (median 54), with 56.5% aged 35-65 and 73.3% males. Mean hospitalization 6.61 ± 5.57 days (median 5), with 64% staying <7 days. 53.4% were hypertensive, and 67.7% had head and neck oncological conditions. Of oncological patients, 94.5% had tumor-related bleeding. Bleeding occurred during disease evolution (52.2%) or post-operatively (24.8%). 75.3% of oncological patients had recurrent bleeding. 72% of bleeding was spontaneous.

- **Stopping Methods:** 6.8% (11 patients) were non-responsive; of the rest, 44% had local maneuvers, 29.3% surgical treatment, and 26.7% stopped spontaneously. Surgical methods were primarily cauterization (70.5%), ligation (22.7%), or tracheostomy + cautery/ligation (6.8%).

- **Outcomes:** 69.6% had anemia (33% moderate, 29.5% mild). 15 patients (9.3%) died; 8 of these had life-threatening anemia. Oncological patients had a significantly higher

mortality rate (100% vs. 64.4% for survivors). Life-threatening anemia was significantly associated with mortality (61.5% vs. 0% for mild anemia). Oncological patients required significantly more transfusions (97.4% vs. 58.2%). Recurrent bleeding also required significantly more transfusions (84.6% vs. 45.9%).

◦ **Post-Tonsillectomy Hemorrhages:** 35 patients, mean age 28.83 ± 6.82 years (median 30), with 82.9% under 35 years. Mean hospitalization 3.91 ± 2.81 days (median 4), 97.1% <7 days. No HTA or oncological conditions were observed. Only 17.1% had recurrences. Only 1 patient (2.9%) was on anticoagulants. Most bleeding occurred between days 6-8 (68.57%) post-op. 54.3% were post-trauma (e.g., hard food ingestion). Most stopped with local maneuvers (77.1%), with surgical intervention (100% cauterization) for 14.3%. Only 28.6% needed IV hemostatics, and none required transfusions. 37.1% developed mild/moderate anemia.

◦ **Comparative Analysis:**

▪ **Age:** Tracheitis patients were significantly older (median 63) than epistaxis (median 55.5) or pharyngo-laryngeal hemorrhage (median 54) patients.

▪ **Gender:** Females had more epistaxis (40%) than tracheitis (23.6%) or pharyngo-laryngeal hemorrhages (26.7%), while males showed the opposite trend (76.4%/73.3% vs. 60%).

▪ **Hospitalization:** Tracheitis patients had significantly shorter hospital stays (median 5) than epistaxis patients (median 6).

▪ **HTA:** Patients with HTA had more epistaxis (63.8%) than tracheitis (42.4%).

▪ **Anticoagulants:** Patients on anticoagulants had more epistaxis (46.9%) than tracheitis (19.7%) or pharyngo-laryngeal hemorrhages (10.6%).

▪ **Recurrence:** Recurrent bleeding was more frequent in epistaxis (71.9%) than tracheitis (40.4%) or pharyngo-laryngeal hemorrhages (55.3%).

▪ **Spontaneous Bleeding/Stopping:** Spontaneous bleeding was most frequent in pharyngo-laryngeal hemorrhages (72%). Spontaneous stopping was most frequent in tracheitis (73.4%) compared to epistaxis (7.7%) or pharyngo-laryngeal (24.8%).

▪ **Anemia:** Anemia was most frequent in pharyngo-laryngeal hemorrhages (69.6%) compared to epistaxis (50.7%) or tracheitis (5.4%).

▪ **Mortality:** Most deaths occurred in pharyngo-laryngeal hemorrhage patients (9.3% vs. 0.5% for tracheitis), all of whom had ORL oncological pathology.

2.4. Discussions

◦ **Rhinosinusal Hemorrhages:** These are the most frequent ORL emergencies due to the rich vascular network (anastomoses between internal/external carotid systems), the presence of Kiesselbach's plexus (90% of anterior epistaxis), and the exposed ethmoidal arteries. Surgical precautions in FESS include safety, precise planning, informed consent, pre-operative management, and continuous research. Complications include minor (1-5%) and major (0.1-1%) intraoperative bleeding, and post-operative bleeding (2-8%). Risk factors include paranasal sinus anatomy, coagulopathies, HTA, aggressive surgical maneuvers, and surgeon experience. Detailed anatomical knowledge of structures like the lamina papyracea, anterior and posterior ethmoidal arteries, and sphenoid sinus is crucial to prevent complications like intraorbital hemorrhage or optic nerve damage. The sphenopalatine artery is a major source of posterior epistaxis.

◦ **Juvenile Nasopharyngeal Angiofibroma (JNA):** A rare, benign, slow-growing vascular tumor exclusively affecting young adolescent males (9-19 years). Cardinal symptoms are recurrent epistaxis, nasal obstruction, headache, and facial pain. Diagnosis relies on history, clinical/endoscopic examination, and imaging (CT, MRI, angiography), with biopsy being contraindicated due to high bleeding risk. Histologically, JNAs are highly vascular, lacking elastic and muscular fibers, contributing to fragility. Pathogenesis involves endocrine disturbance of vascular maturation. Radkowsky classification (IA to IIIB) guides treatment. Surgical excision with pre-operative embolization is the treatment of choice, significantly reducing intraoperative bleeding. Endoscopic transnasal approach is preferred for lower morbidity and similar recurrence rates compared to classic open approaches.

◦ **Rendu-Osler-Weber Syndrome (Hereditary Hemorrhagic Telangiectasia - HHT):** A rare, autosomal dominant systemic vascular malformation syndrome. Characterized by fragile telangiectasias and arteriovenous malformations, primarily in skin, mucous membranes (face, lips, tongue, nasal/GI mucosa), and solid organs (liver, lungs, brain). **Recurrent epistaxis is the predominant symptom (90-95%),** leading to chronic anemia and iron depletion. Diagnosis is confirmed by Curaçao criteria (recurrent epistaxis, specific telangiectasias, visceral AVMs, family history). Management is multidisciplinary

and individualized, including local (cautery, laser, hemostatics) and systemic therapies (anti-angiogenic agents), with challenges in achieving complete control.

- **Hemorrhages in Malignant Head and Neck Tumors:** A common complication of advanced or metastatic tumors. Bleeding occurs due to direct tumor invasion eroding major blood vessels (e.g., carotid artery), often fatal. Reduced immunity, bacterial infections, and fistulas can lead to vascular erosion. Radiotherapy and prior surgeries weaken vascular structures, increasing bleeding risk (up to 7.6 times). Chemotherapy causes vascular toxicity and thrombocytopenia. Anti-angiogenic therapies (e.g., Bevacizumab) are associated with higher hemorrhagic events. Acute management includes airway maintenance (intubation/tracheostomy), direct pressure, local hemostatics, and volume resuscitation. Interventional procedures like selective endovascular embolization or surgical ligation are used for refractory cases. Systemic hemostatics (adrenostazin, etamsylate, phytomenadione, tranexamic acid) are adjuncts. Palliative care focuses on comfort in terminal stages.

- **Post-Tracheotomy Hemorrhages:** A common complication, especially in emergencies. Bleeding can be intraoperative, early (first 24-48 hours), or late (after 72 hours). Risk is increased by anticoagulants, coagulation disorders, and emergency status. Intraoperative bleeding can be reduced by median dissection, good illumination, and careful identification/ligation/cauterization of vessels (e.g., Ligasure). Early post-op bleeding occurs if vasoconstriction wears off or vessels aren't sealed, requiring reintervention. Late complications include tracheo-innominate artery fistula (fatal in >75% cases) due to cannula malposition or infection. Percutaneous tracheotomy generally has lower complication rates. Prior surgery or radiation to the neck increases difficulty and risk.

- **Vocal Cord Hemorrhages:** Acute events affecting vocal function. Peretti's studies describe a deep submucosal and superficial subepithelial microvascular network, with a vulnerable longitudinal capillary plexus along the free margin of the vocal cord. Causes include mechanical trauma, vocal strain, pre-existing vascular lesions, coagulopathies, and anticoagulant use. Symptoms: sudden dysphonia/aphonia, laryngeal pressure/burning (no pain), edema. Diagnosis by laryngoscopy (white light, NBI for vascular details) and stroboscopy. Treatment: complete vocal rest (7-10 days), anti-inflammatories, corticosteroids, avoiding anticoagulants. Prognosis is generally favorable with early treatment.

◦ **Hemorrhagic Accidents in Phonosurgery:** Intraoperative bleeding is a significant complication impacting functional outcomes. Etiology includes accidental injury to plexuses, deep epithelial detachment, abnormal angioarchitecture, pre-existing vascular fragility, and traumatic instrumentation. Prevention: precise submucosal dissection, atraumatic instruments, laser coagulation for small vessels. Management: delicate compression, laser/bipolar coagulation, topical adrenaline, or abandoning the procedure. Post-op: strict vocal rest, anti-inflammatory treatment.

◦ **Post-Intubation Hemorrhages:** Significant, often underestimated complication of orotracheal/nasotracheal intubation. Head and neck structures are richly vascularized and exposed to iatrogenic trauma. Causes: direct mechanical trauma, laryngeal/pharyngeal lesions from laryngoscope, excessive cuff pressure, pre-existing vascular conditions, coagulation disorders. Risk factors: limited operator experience, emergency intubation, excessive force, difficult anatomy, advanced age, anticoagulants. Diagnosis by anterior rhinoscopy, nasal endoscopy, laryngoscopy. Treatment depends on severity/localization: nasal packing, vasoconstrictors, cauterization, cold solutions, systemic hemostatics, surgical excision. Prevention involves pre-evaluation, atraumatic technique, proper tube size, and cuff pressure control.

◦ **Post-Tonsillectomy Hemorrhages:** Main source of post-operative morbidity. Tonsils are richly vascularized (facial, palatine, lingual, pharyngeal ascending arteries), with internal carotid artery proximity (2.5 cm postero-lateral). Intraoperative bleeding influenced by anatomy, technique, and surgeon experience. Hemostasis techniques include electrocautery (mono/bipolar), ligation, vascular clips, topical agents. Coblation, electrocautery, and cold dissection are common techniques, each with pros/cons regarding bleeding and post-op pain. Post-operative bleeding is early (<24h, due to insufficient hemostasis) or late (>24h, commonly 5-10 days, due to clot disintegration). Incidence 2-5%, higher in adolescents/adults. Heat-based techniques increase late bleeding risk due to unstable crusts. Management: conservative for mild, emergency surgical for active bleeding.

◦ **Hemorrhages Associated with Cervico-Facial Trauma:** Severe medical emergencies. Classified by mechanism (contusion, sharp injury, explosion, burns) or region. Nasal trauma is most common (epistaxis, fractures, septal hematoma). Laryngeal/tracheal injuries are rare but potentially fatal. Cervical soft tissue trauma zones (I, II, III) with specific

vascular risks. Treatment: direct pressure, packing, vasoconstrictors, systemic hemostatics, embolization, or arterial ligation. Imaging is essential.

◦ **Middle Ear Glomus and Endoscopic Otological Surgery Hemorrhages:**

Tympanic paragangliomas are hypervascular benign tumors. Symptoms: conductive hearing loss, pulsatile tinnitus, hematic otorrhea. Endoscopic surgery offers superior visualization but requires careful management of intraoperative bleeding. Hemostasis techniques: fine bipolar, topical hemostatics, vasoconstrictors. Pre-operative embolization significantly reduces bleeding risk. NBI (Narrow Band Imaging) video-endoscopic evaluation is crucial for precise analysis of hemorrhagic areas.

2.5. Conclusions and Personal Contributions

General Conclusions:

- Approximately a quarter of epistaxis patients require advanced medico-surgical treatment. HTA is frequently associated with epistaxis (63.84%).
- Severe epistaxis correlates with cardiovascular pathologies, posterior localization, electrocauterization, and longer hospitalization.
- Anterior epistaxis, less severe, requires shorter hospitalization, and anterior nasal packing is effective for stopping it.
- Post-operative epistaxis is common and requires targeted hemostasis.
- Lower hemoglobin levels correlated with severe and recurrent epistaxis and longer hospital stays. Oncological patients were more associated with recurrent epistaxis.
- Electrocauterization was associated with recurrent epistaxis, while anterior nasal packing was used less frequently for recurrent cases.
- Juvenile nasopharyngeal angiofibroma was mostly managed endoscopically due to its advantages, with only one recurrence linked to complex vascularization.
- Acute tracheitis hemorrhages were minor, spontaneous, or post-viral, mainly in older male patients with oncological conditions, often self-limiting and rarely requiring active intervention.
- Pharyngo-laryngeal and laterocervical hemorrhages were primarily spontaneous in oncological patients, often recurrent and lethal, requiring complex surgical interventions and

frequent transfusions. Mortality was linked to oncological pathology and life-threatening anemia.

- Post-tonsillectomy hemorrhages were generally mild, late-onset (day 6-8), often traumatic (e.g., hard food ingestion), managed with local maneuvers, and rarely required transfusions or surgical intervention.

- Comparative analysis showed age distribution varied by hemorrhage type (epistaxis younger, tracheitis older, pharyngo-laryngeal middle-aged). Males were more affected by tracheitis and pharyngo-laryngeal hemorrhages. Hospitalization was shorter for tracheitis. HTA and anticoagulant use were more common in epistaxis patients. Spontaneous bleeding was highest in pharyngo-laryngeal cases, often due to tumor progression. Spontaneous stopping was highest in tracheitis. Anemia was most frequent in pharyngo-laryngeal hemorrhages (often paraneoplastic). Mortality was highest in pharyngo-laryngeal cases, specifically in oncological patients.

- Video-endoscopic evaluation with NBI is crucial for highly vascularized areas, tumors, and hereditary telangiectasias, allowing for accurate analysis and post-hemorrhage control.

Personal Contributions:

1. Identified statistically significant correlations between hemorrhage typology, severity, hospitalization duration, and clinical/paraclinical parameters, enabling risk stratification and therapeutic guidance.

2. Detailed characterization of recurrent and severe epistaxis, highlighting electrocauterization's role in severe forms and the limitations of anterior nasal packing in recurrent cases.

3. Validated the endoscopic transnasal approach for juvenile nasopharyngeal angiofibroma, confirming its safety and efficacy, especially with pre-operative embolization.

4. Systematically documented hemorrhagic tracheitis in tracheostomized patients, providing data on viral etiology, seasonality, and favorable prognosis.

5. Established a strong link between pharyngo-laryngeal hemorrhages and tumor recurrence, demonstrating spontaneous bleeding as an early indicator of neoplasia progression.

6. Conducted a detailed intergroup comparison, providing a distinct clinical profile for each hemorrhage type, guiding personalized medical decisions.

7. Contributed directly to the collection, analysis, and interpretation of clinical data from a representative cohort, enriching national and international medical literature on cervico-cephalic hemorrhages.

This work proposes an integrated and stratified clinical approach to head and neck hemorrhages, based on type, etiology, patient context, and severity, with direct implications for therapeutic management, recurrence prevention, and prognostic evaluation.

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Lista cu lucrările științifice publicate

1.

Pulpă R.O., Voiosu C., Aliuș R.O., Ioniță I.G., Rusescu A., Hainăroșie R., Zainea V., **Rendu-Osler disease, a cause of recurrent epistaxis: a case report**, Journal of Medicine and Life, 2025, 18(4), pag. 397–401, FI: în curs, capitolul III,

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2.

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