10.48047/jocaaa.2024.33.06.139

Rheumatoid Arthritis-Associated Oropharyngeal Dysphagia: Diagnostic and Clinical Insights from VFSS

Ebtesam Emad Talaat Abdelhamid [1], Amal Saeed Quriba[2], Elham Magdy Hassan [3], Sameh Saber Bayoumi [4], Samah Mahmoud Alian[5], Omnia Zakaria El-Shebl [6]

(1) MBBCH, Resident of Phoniatrics Benha University Hospitals,
(2) Professor of Phoniatrics E.N.T, Faculty of Medicine, Zagazig University,
(3) Assistant Professor of Phoniatrics E.N.T, Faculty of Medicine, Zagazig University,
(4) Assistant Professor of Radiology, Faculty of Medicine, Zagazig University,
(5) Assistant Professor of Rheumatology, Physical medicine and Rehabilitation, Faculty of Medicine, Zagazig University
(6) Lecturer of Phoniatrics E.N.T, Faculty of Medicine, Benha University
Corresponding author: Ebtesam Emad Talaat Abdelhamid
Received: 13 March 2024, **Accepted:** 17 April 2024, **Published:** 20 May 2024

ABSTRACT

Background: Rheumatoid arthritis (RA) is a chronic systemic autoimmune disorder primarily affecting synovial joints, with potential multisystem involvement. While the articular manifestations of RA are well-recognized, its impact on oropharyngeal structures and swallowing function remains underappreciated. Dysphagia, defined as difficulty in swallowing, is a frequently overlooked symptom in RA patients and may result from musculoskeletal, neurological, and anatomical alterations related to the disease. The involvement of cervical spine joints, temporomandibular joints (TMJ), cricoarytenoid joints (CAJ), and pharyngeal musculature may contribute to oropharyngeal dysfunction and compromised airway safety. Timely recognition and precise diagnosis of dysphagia are critical, given the associated risks of aspiration, malnutrition, and reduced quality of life.

Aim: This review aims to comprehensively examine the etiology, clinical manifestations, and diagnostic approach to oropharyngeal dysphagia in patients with rheumatoid arthritis, with an emphasis on the role of videofluoroscopic swallowing study (VFSS) as a gold standard diagnostic tool. Additionally, the article discusses esophageal dysphagia, voice disorders, and the interplay between RA-related structural abnormalities and functional impairments in the upper aerodigestive tract.

Scope and Methodology: An extensive review of published literature was conducted using databases such as PubMed, Scopus, and Google Scholar. Relevant articles addressing dysphagia in RA, VFSS findings, and associated laryngeal and esophageal dysfunctions were critically analyzed. Key clinical symptoms, instrumental assessments including VFSS and manometry, and therapeutic options—both medical and surgical—were compiled to create a detailed diagnostic and management framework.

Conclusion: Dysphagia in RA patients represents a clinically significant yet underdiagnosed problem with diverse etiologies, including joint inflammation, neuromuscular dysfunction, and anatomical deformities. VFSS offers a dynamic and objective visualization of swallowing mechanics, allowing for precise localization of dysfunction. Comprehensive assessment combining clinical evaluation, imaging, and endoscopic tools is vital to identify swallowing and voice-related complications early. Multidisciplinary management, encompassing pharmacological intervention, dietary modification, rehabilitation, and in select cases, surgical correction, is essential for optimizing outcomes and improving quality of life. Recognition of oropharyngeal dysphagia as part of the RA spectrum

10.48047/jocaaa.2024.33.06.139

necessitates greater awareness among clinicians and integration of routine swallowing assessments into rheumatologic care protocols.

Keywords: Oropharyngeal Dysphagia, Rheumatoid Arthritis, VFSS

INTRODUCTION

Rheumatoid arthritis (RA) is a chronic, systemic autoimmune disease characterized by symmetric polyarthritis and progressive joint destruction. Beyond the musculoskeletal system, RA exerts significant extra-articular effects, involving the cardiovascular, pulmonary, and gastrointestinal systems. However, the oropharyngeal and laryngeal manifestations—particularly dysphagia and voice changes—are often overlooked despite their potential impact on morbidity, quality of life, and nutritional status [1]. Dysphagia, defined as difficulty in swallowing, may occur in RA due to joint destruction, muscle dysfunction, neurological involvement, or anatomical compression. Oropharyngeal dysphagia is particularly concerning due to its association with aspiration, recurrent pneumonia, and malnutrition [2].

Rheumatoid arthritis can compromise swallowing function through a variety of mechanisms, including inflammatory involvement of the temporomandibular joint (TMJ), cervical spine instability (especially atlantoaxial subluxation), and cricoarytenoid joint (CAJ) arthritis. These changes can affect structural integrity and neuromuscular coordination during the act of swallowing [3]. In addition, systemic inflammation may lead to myopathy or neuromuscular weakness, further impairing deglutition. The presence of xerostomia due to secondary Sjögren's syndrome also contributes to difficulty in bolus formation and propulsion [4].

Despite the high prevalence of subclinical and clinical dysphagia in RA patients, routine screening and objective assessment are rarely incorporated into rheumatologic evaluation. Many patients remain undiagnosed until complications such as aspiration pneumonia or significant weight loss occur. Videofluoroscopic Swallowing Study (VFSS) provides dynamic imaging of the swallowing process, allowing for a comprehensive assessment of both structural abnormalities and functional impairment across the oral, pharyngeal, and esophageal phases [5].

The **aim of this review** is to provide a detailed exploration of oropharyngeal and esophageal dysphagia in RA patients, emphasizing its multifactorial etiology, clinical manifestations, and diagnostic approach, with special focus on the role of VFSS. Additionally, this article addresses related voice disorders, evaluates therapeutic strategies, and highlights the impact of dysphagia on patient quality of

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life. By synthesizing current evidence, we aim to bridge a critical gap in clinical awareness and promote early identification and management of swallowing dysfunction in RA.

Dysphagia: Symptoms and Signs

Dysphagia, or impaired swallowing, is not a single disease but a symptom of underlying anatomical, neuromuscular, or functional disorders affecting the oral cavity, pharynx, larynx, or esophagus. It is typically classified into two broad categories: **oropharyngeal (transfer) dysphagia**, which affects the initiation of a swallow and the movement of the bolus from the oropharynx into the esophagus; and **esophageal (transport) dysphagia**, which involves difficulty in the passage of the bolus through the esophagus into the stomach [6]. In patients with rheumatoid arthritis, oropharyngeal dysphagia is more common due to articular and muscular involvement of upper aerodigestive tract structures.

Common **symptoms of dysphagia** include coughing or choking during meals, a sensation of food "sticking" in the throat, nasal regurgitation, hoarseness, and repeated throat clearing. Patients may also present with weight loss, dehydration, recurrent aspiration pneumonia, and reluctance to eat, which can lead to social withdrawal and malnutrition [7]. In advanced cases, silent aspiration—aspiration of food or liquids without cough reflex—poses a severe risk due to lack of warning signs.

Clinically, **signs of oropharyngeal dysphagia** may include weak or wet voice post-swallow, pooling of food in the oral cavity, anterior spillage, delayed swallow initiation, and reduced laryngeal elevation. Objective tools like VFSS or fiberoptic endoscopic evaluation of swallowing (FEES) are essential to observe these signs directly [8]. It is important for clinicians to differentiate these symptoms from esophageal causes or psychogenic dysphagia, as management strategies differ significantly.

The **prevalence of dysphagia in RA** is likely underestimated, in part due to subtle early symptoms and the absence of routine screening in rheumatology settings. Some patients adapt to symptoms by altering their diet or eating behavior, masking the severity of dysfunction. Recognizing early signs of dysphagia and initiating timely instrumental evaluation, such as VFSS, can prevent serious complications and support nutritional rehabilitation in affected individuals [9].

Etiology of Oropharyngeal Dysphagia

I. Causes of Oropharyngeal Dysphagia

Oropharyngeal dysphagia arises from structural or functional abnormalities that impair the voluntary initiation of swallowing or the coordination of bolus transit through the pharynx into the esophagus. In the context of rheumatoid arthritis, the causes are typically multifactorial, involving musculoskeletal, neurological, and inflammatory mechanisms. TMJ involvement may impair mastication, while inflammation of the pharyngeal and laryngeal muscles reduces their coordination and strength, affecting the oropharyngeal phase of swallowing [10].

RA-related **cricoarytenoid arthritis** is another significant cause. The cricoarytenoid joint plays a crucial role in laryngeal opening during swallowing. Inflammation or fixation of this joint can lead to

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airway obstruction or aspiration due to impaired glottic closure. Additionally, **atlantoaxial subluxation** and cervical spine instability may compress the medulla or cranial nerves, further compromising swallowing reflexes and motor coordination [11].

Moreover, systemic inflammation may lead to **myopathy of the pharyngeal and upper esophageal musculature**, further reducing propulsion force and bolus clearance. Secondary Sjögren's syndrome, common in RA patients, contributes to dry mouth and impaired bolus formation, complicating the swallowing process even in the absence of structural abnormalities [12].

Some causes are non-rheumatologic but co-exist or are exacerbated in RA patients, such as **stroke**, **Parkinson's disease**, or **myasthenia gravis**. Therefore, in patients with RA presenting with dysphagia, a broad differential diagnosis must be considered and investigated appropriately [13].

In clinical practice, accurate identification of the underlying cause is essential for tailored treatment. Differentiating between structural joint-related causes and neuromuscular disorders is facilitated by instrumental studies like VFSS and manometry, which provide both anatomical and functional insights into swallowing mechanics [14].

II. General Medical Disorders as Causes of Oropharyngeal Dysphagia

General medical conditions that affect systemic health or interfere with muscular coordination, immune response, or neurological function can significantly contribute to oropharyngeal dysphagia. In patients with rheumatoid arthritis (RA), these systemic disorders may exacerbate existing oropharyngeal dysfunction or independently impair swallowing mechanics. **Endocrine disorders**, such as hypothyroidism and diabetes mellitus, are common in RA and can result in myopathy or neuropathy, reducing the efficiency of pharyngeal contraction and laryngeal elevation [15].

Chronic renal failure and **hepatic dysfunction**, frequently seen in patients on long-term immunosuppressive therapy, can also contribute to neuromuscular dysfunction and uremic neuropathy, which impair the swallowing reflex. Additionally, **malnutrition** and **cachexia**, common in systemic autoimmune diseases, lead to muscular wasting, including the oropharyngeal and esophageal muscles, further increasing the risk of dysphagia [16].

Cardiopulmonary comorbidities may also indirectly affect swallowing. For instance, **chronic obstructive pulmonary disease (COPD)**, which may co-occur in RA patients, can alter the timing between swallowing and breathing, increasing the risk of aspiration. Similarly, **congestive heart failure** can lead to fluid overload and laryngeal edema, which may obstruct the glottis or impair closure during swallowing [17].

Immunosuppressive treatments, including methotrexate and corticosteroids, while critical in controlling RA inflammation, can contribute to muscle weakness or cause esophageal candidiasis, leading to discomfort and impaired swallowing. Some immunosuppressants may also have neurotoxic side effects, which subtly impair neuromuscular coordination of the swallow reflex [18].

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Therefore, in patients with RA presenting with dysphagia, clinicians must evaluate general systemic health to identify and manage any contributing medical disorders. Correcting these conditions may not only improve overall health but also restore more effective swallowing function and prevent complications such as aspiration pneumonia or malnutrition [19].

III. Neurological, Neuromuscular, and Muscular Causes of Oropharyngeal Dysphagia

Neurological and neuromuscular disorders are among the most significant contributors to oropharyngeal dysphagia, particularly due to their impact on the complex sensorimotor coordination required for safe and efficient swallowing. In the context of rheumatoid arthritis (RA), these causes may be **primary**, such as neurodegenerative diseases that co-exist with RA, or **secondary**, resulting from cervical spine involvement or systemic inflammatory effects on the nervous system [20].

Atlantoaxial subluxation, a well-documented complication of RA, can compress the spinal cord or lower cranial nerves (especially CN IX and X), leading to dysphagia, impaired gag reflex, or even aspiration. Furthermore, **vasculitis** associated with RA may lead to peripheral or cranial neuropathies that impair pharyngeal or laryngeal function [21]. Rarely, **rheumatoid meningitis**, though uncommon, may result in bulbar dysfunction, further complicating swallowing [22].

Coexisting neuromuscular disorders such as **myasthenia gravis**, **dermatomyositis**, or **polymyositis**—which may occur in autoimmune clustering—can also cause severe oropharyngeal dysphagia by impairing neuromuscular transmission or muscle integrity. These conditions affect the striated muscles of the oropharynx and upper esophagus, leading to fatigue, delayed swallow initiation, and incomplete bolus clearance [23].

In addition, **inflammatory myopathy** related to RA itself or associated conditions like Sjögren's syndrome can result in proximal muscle weakness, affecting the tongue base, pharyngeal constrictors, and suprahyoid muscles. This can reduce pressure generation, impair upper esophageal sphincter opening, and increase pharyngeal residue or aspiration risk [24].

Patients with neurological or neuromuscular causes of dysphagia often present with more **insidious, progressive symptoms**, and are at high risk of silent aspiration. VFSS is crucial in identifying characteristic features such as delayed laryngeal elevation, weak pharyngeal stripping wave, and cricopharyngeal dysfunction. Early diagnosis and tailored interventions, such as swallowing therapy and disease-specific medical treatment, are essential for improving outcomes [25].

IV. Head and Neck Anatomical Abnormalities

Anatomical abnormalities of the head and neck region can significantly impair the swallowing process by altering the mechanical pathway or disrupting neuromuscular coordination. In patients with rheumatoid arthritis (RA), such abnormalities may result from joint erosion, chronic inflammation, deformity, or surgical interventions, all of which can contribute to oropharyngeal dysphagia [26].

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One of the most clinically significant structural causes in RA is **temporomandibular joint (TMJ) involvement**, which occurs in up to 80% of patients. TMJ destruction leads to reduced mandibular mobility, impaired mastication, malocclusion, and restricted mouth opening (trismus), all of which interfere with the oral preparatory phase of swallowing. Difficulty chewing and forming a cohesive bolus may delay swallowing initiation and increase the risk of choking or aspiration [27].

Additionally, **cricoarytenoid joint (CAJ) arthritis**, another well-recognized manifestation of RA, results in narrowing of the glottic inlet and impaired vocal fold mobility. This affects the laryngeal protective mechanism during swallowing, predisposing patients to aspiration and voice changes such as hoarseness or breathiness. In severe cases, bilateral CAJ fixation can lead to stridor or airway obstruction, necessitating tracheostomy [28].

Cervical spine deformities, particularly **atlantoaxial subluxation**, may cause mechanical compression of the pharyngeal space or spinal cord, leading to altered sensation and reduced motor control of pharyngeal musculature. Furthermore, the anatomical distortion from cervical instability can alter the angle and passage of the esophagus, increasing the mechanical resistance to bolus transit and contributing to dysphagia [29].

Post-surgical anatomical changes from cervical fusion or TMJ replacement procedures may also result in stiffness, scarring, and restricted mobility of adjacent soft tissues and joints, further exacerbating dysphagia. Moreover, **rheumatoid nodules** in the posterior pharyngeal wall or laryngeal structures have been reported to cause physical obstruction, ulceration, and localized inflammation that interferes with swallowing [30].

Recognition of these anatomical abnormalities through imaging and dynamic studies like VFSS is essential to differentiate structural dysphagia from functional or neuromuscular causes. Their management often requires a combined approach involving rheumatology, otolaryngology, and maxillofacial surgery.

V. Other Causes of Oropharyngeal Dysphagia: Infections, Systemic Disorders, and Pharmacological Side Effects

Beyond the structural and neuromuscular origins, several **other systemic and external factors** can contribute to oropharyngeal dysphagia, particularly in immunocompromised or elderly RA patients. These include infections, systemic inflammatory conditions, and adverse effects of pharmacologic therapies commonly used in RA management.

Infections of the oropharynx and upper respiratory tract, such as **pharyngitis**, **epiglottitis**, or **peritonsillar abscess**, may cause temporary dysphagia due to pain, inflammation, and swelling. In immunosuppressed RA patients, **opportunistic infections** such as **esophageal candidiasis** or **herpes simplex virus esophagitis** can extend to the pharyngeal region, causing odynophagia (painful

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swallowing) and functional obstruction [31]. These conditions are often underdiagnosed due to subtle symptoms and can be confirmed via endoscopic examination or barium swallow studies.

Systemic disorders, such as **amyloidosis**, **sarcoidosis**, or **vasculitis**, can involve the pharyngeal and esophageal muscles or mucosa, leading to structural stiffness and neuromuscular impairment. Infiltrative diseases may also impair cranial nerves or central regulatory centers, causing discoordination of the swallow reflex [32]. Furthermore, **Sjögren's syndrome**, which frequently coexists with RA, leads to xerostomia (dry mouth), compromising the lubrication and cohesion of the food bolus and impairing the oral and oropharyngeal phases of swallowing [33].

Pharmacological agents used in RA management may also play a role. **Corticosteroids**, while effective for inflammation control, can lead to **steroid myopathy**, which affects the proximal skeletal muscles involved in swallowing. **Disease-modifying antirheumatic drugs (DMARDs)** and biologics may suppress the immune system, predisposing patients to mucosal infections and gastrointestinal side effects that contribute to dysphagia [34]. Additionally, medications like **anticholinergics**, **opioids**, and **tricyclic antidepressants** often used for comorbidities can impair salivary secretion, esophageal motility, or lower esophageal sphincter tone, exacerbating swallowing difficulties [35].

Recognizing these iatrogenic and systemic contributors is crucial in the holistic assessment of dysphagia in RA patients. Adjusting medication regimens, managing infections promptly, and monitoring for secondary syndromes like Sjögren's can significantly improve swallowing function and reduce associated risks.

VI. Psychogenic Dysphagia

Psychogenic dysphagia, also referred to as **functional or non-organic dysphagia**, is characterized by a subjective sensation of swallowing difficulty in the absence of anatomical or physiological abnormalities. While rare compared to structural or neurological causes, it is an important diagnostic consideration, especially in patients with chronic illness like rheumatoid arthritis (RA), who may also experience psychological distress, depression, or anxiety [36].

In functional dysphagia, patients may present with a persistent sensation of a lump in the throat (globus pharyngeus), fear of choking, or avoidance of solid foods without objective findings on imaging, endoscopy, or manometry. This condition is often associated with **underlying psychiatric disorders** such as **hysteria**, **somatization disorder**, **severe depression**, or **generalized anxiety disorder**, all of which are prevalent in chronic rheumatologic populations [37].

RA patients are particularly vulnerable to **psychogenic contributors** due to the chronic nature of their disease, pain, functional limitations, and reduced quality of life. The presence of dysphagia in these individuals may be multifactorial, with functional components superimposed on mild or subclinical physiological changes. As a result, psychogenic dysphagia is often diagnosed by exclusion, after thorough evaluation has ruled out structural, neuromuscular, and infectious etiologies [38].

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The diagnosis is further complicated by **overlapping symptoms** such as throat tightness, altered voice, and swallowing fear, which may mimic organic disorders. In such cases, videofluoroscopic swallowing studies (VFSS) or fiberoptic endoscopic evaluation of swallowing (FEES) may show normal physiology, but sometimes demonstrate inconsistent or effortful swallows that correlate poorly with the patient's complaints, supporting a functional etiology [39].

Management of psychogenic dysphagia requires a **multidisciplinary approach**, including psychological or psychiatric evaluation, cognitive behavioral therapy, and in some cases, antidepressant or anxiolytic medications. Speech-language pathologists play a crucial role in behavior-based swallowing therapy, helping to desensitize patients to the act of swallowing and rebuild confidence in eating safely [40].

The Etiology of Esophageal Dysphagia

Esophageal dysphagia refers to difficulty in the passage of a bolus from the esophagus into the stomach, and is commonly caused by mechanical obstruction, motility disorders, or structural changes in the esophageal wall. In patients with **rheumatoid arthritis (RA)**, although oropharyngeal dysphagia is more commonly discussed, esophageal involvement is not uncommon and may significantly impact swallowing function and nutritional status [41].

RA can lead to **smooth muscle involvement** and **esophageal dysmotility**, particularly of the **upper third of the esophagus**, which is composed of striated muscle. Chronic systemic inflammation and vasculitis can damage the nerves or muscles responsible for esophageal peristalsis, resulting in impaired bolus transit and delayed esophageal clearance [42]. In some cases, these changes are subclinical and only evident on manometric or radiologic evaluation.

Another mechanism in RA patients is **secondary Sjögren's syndrome**, which affects the salivary and mucosal glands and leads to dry mucosa, increasing resistance to bolus passage and predisposing to esophageal injury. The dryness and lack of lubrication reduce esophageal clearance and may exacerbate reflux symptoms [43].

Mechanical causes, such as **esophageal strictures**, **webs**, or **rings**, may also coexist or result from long-term gastroesophageal reflux disease (GERD), which is prevalent in patients with RA due to chronic corticosteroid use and associated motility issues. Furthermore, **drug-induced esophagitis**—from medications like NSAIDs, bisphosphonates, and doxycycline—can cause ulceration or scarring that narrows the esophageal lumen, leading to progressive dysphagia [44].

Esophageal involvement may also be due to **coexisting autoimmune disorders**, such as **systemic sclerosis**, which shares clinical and serologic features with RA in certain overlap syndromes. These patients can experience severe dysmotility due to fibrosis and smooth muscle atrophy of the lower two-thirds of the esophagus [45].

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Diagnosis of esophageal dysphagia in RA patients requires a high index of suspicion and the use of tools such as **barium swallow**, **manometry**, and **upper endoscopy**. These help differentiate between obstructive and motility-related causes and guide appropriate management strategies, ranging from dietary modifications and pharmacotherapy to dilation procedures in cases of strictures.

Assessment of Dysphagia

A. Clinical/Bedside Measures of Dysphagia

Careful Taking of Patient History

A thorough clinical history is the cornerstone of dysphagia assessment and helps guide further diagnostic steps. In patients with **rheumatoid arthritis (RA)**, it is crucial to differentiate between oropharyngeal and esophageal symptoms. Key questions should address the **onset**, **duration**, and **progression** of symptoms, including choking, coughing during meals, nasal regurgitation, voice changes, and the sensation of food sticking in the throat or chest. In RA patients, clinicians should also inquire about **TMJ dysfunction**, **neck pain**, **voice hoarseness**, **dry mouth**, and **history of reflux or aspiration** [46].

Additionally, history should assess **medication use**, including corticosteroids, NSAIDs, and immunosuppressants, which may contribute to mucosal injury or muscle weakness. The presence of comorbid conditions like **Sjögren's syndrome**, **neurological disorders**, or **depression** should also be explored. Functional symptoms such as anxiety around swallowing or food avoidance may suggest psychogenic components [47].

A well-taken history helps determine whether symptoms point to **neuromuscular**, **structural**, or **functional causes**, guiding selection of the appropriate instrumental assessment such as VFSS or endoscopy.

Physical Examination

The physical exam in dysphagia assessment should focus on **neurological**, **musculoskeletal**, and **oropharyngeal** structures. Examination of the **oral cavity and oropharynx** should include inspection for mucosal dryness, poor dentition, oral ulcers, or signs of infection. **TMJ assessment** is essential in RA patients, as reduced jaw opening and pain can impair mastication. Palpation of the **neck and submandibular region** may reveal lymphadenopathy or structural abnormalities [48].

Neurological screening should assess **cranial nerves V, VII, IX, X, and XII**, which govern swallowing function. Voice quality, cough strength, and the presence of a gag reflex can provide indirect evidence of laryngeal and pharyngeal integrity. Additionally, observation during a test swallow with water or soft food can identify overt signs of aspiration, such as coughing, throat clearing, or a wet-sounding voice [49].

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Bedside evaluation tools like the **3-ounce water swallow test** or **gugging swallowing screen** can be useful in identifying patients at risk for aspiration. However, these tools should not replace instrumental studies in complex cases, especially in patients with RA, where multifactorial causes may coexist.

B. Laboratory Testing and Imaging

1. Videofluoroscopic Modified Barium Swallow (VFSS)

The **Videofluoroscopic Swallowing Study (VFSS)**, also known as the Modified Barium Swallow, is considered the **gold standard** for dynamic evaluation of oropharyngeal dysphagia. VFSS enables real-time radiographic visualization of all phases of swallowing—from the oral cavity to the upper esophageal sphincter (UES)—as patients ingest barium-coated materials of varying consistencies [50]. In RA patients, VFSS can identify **delayed oral transit**, **pharyngeal residue**, **impaired laryngeal elevation**, **aspiration**, and **UES dysfunction**. It is particularly useful in detecting silent aspiration, which may not be evident during bedside evaluation. Furthermore, VFSS helps distinguish between **neuromuscular** and **structural** causes, providing insights into the biomechanics of swallowing and informing targeted therapy [51].

VFSS also allows clinicians to evaluate the **effectiveness of compensatory maneuvers** and **postural adjustments**, making it a valuable tool in designing individualized rehabilitation plans for RA patients with dysphagia.

2. Fiberoptic Endoscopic Evaluation of Swallowing (FEES)

FEES involves transnasal insertion of a flexible endoscope to directly observe the pharyngeal and laryngeal structures during swallowing. It is especially useful for evaluating **laryngeal function**, **glottic closure**, **residue in the valleculae and pyriform sinuses**, and **aspiration events**, particularly in cases where VFSS is contraindicated or unavailable [52].

In RA patients with **cricoarytenoid arthritis**, FEES can visualize **restricted vocal fold movement**, **edema**, or **rheumatoid nodules**, which may contribute to dysphagia and voice changes. Unlike VFSS, FEES does not expose the patient to radiation and can be performed at the bedside, making it suitable for critically ill or immobile patients [53].

3. Manometry

Esophageal and pharyngeal manometry measures intraluminal pressure during swallowing and is particularly valuable in assessing **UES function**, **pharyngeal contractility**, and **esophageal motility**. In RA, manometry may reveal **hypocontractility**, **discoordination**, or **elevated UES pressure**, especially in patients with **neuromuscular involvement** or **secondary Sjögren's syndrome** [54].

High-resolution manometry (HRM) allows for detailed pressure mapping and is increasingly used in conjunction with VFSS for a comprehensive assessment. Abnormal UES relaxation or reduced peristaltic amplitude may indicate a neuromuscular cause of dysphagia in RA patients [55].

4. Laboratory Tests

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Laboratory investigations play a supportive role in the assessment of dysphagia. **Inflammatory markers** such as ESR and CRP help assess RA activity, while **autoantibodies** (RF, anti-CCP, ANA, SSA/SSB) may suggest overlap syndromes like **Sjögren's syndrome** or **systemic sclerosis**, which have known swallowing implications [56].

Additional lab tests may be used to screen for **nutritional deficiencies**, **thyroid dysfunction**, **creatine kinase** (for myopathies), and **infectious agents** such as Candida in suspected esophageal or oropharyngeal infections. Identifying systemic contributors is essential to holistic dysphagia management in RA patients [57].

Rheumatoid Arthritis: Overview and Systemic Impact on Swallowing

Rheumatoid arthritis (RA) is a chronic, systemic autoimmune disorder primarily targeting synovial joints but with extensive **extra-articular involvement**. Affecting approximately 0.5–1% of the global population, RA is characterized by persistent synovitis, progressive joint destruction, and systemic inflammation. While joint pain and deformity are hallmark features, **mucosal, muscular, neurological, and structural complications** are increasingly recognized as contributors to morbidity—including those affecting the oropharyngeal and esophageal systems [58].

RA pathogenesis involves **autoreactive T cells**, **proinflammatory cytokines** (e.g., TNF-α, IL-1, IL-6), and **autoantibodies** such as rheumatoid factor (RF) and anti-citrullinated protein antibodies (ACPA). These immune mechanisms not only affect joints but can infiltrate muscle tissue, salivary glands, and even the laryngeal and esophageal mucosa, potentially impairing functions such as swallowing, phonation, and airway protection [59].

Swallowing in RA may be disrupted through several pathways. First, **joint involvement**, particularly of the **temporomandibular joints (TMJs)** and **cricoarytenoid joints (CAJs)**, impairs oral and laryngeal mobility. Second, **muscle inflammation** and **myopathy**—either as part of RA or a coexisting inflammatory myositis—can weaken oropharyngeal and esophageal musculature. Third, **neurological complications** such as cervical spine instability can compress cranial nerves essential for swallowing, particularly glossopharyngeal (CN IX) and vagus (CN X) [60].

Moreover, **secondary Sjögren's syndrome**, present in a significant subset of RA patients, leads to xerostomia and thickened oral secretions that hinder bolus formation and transit. Some patients also develop **systemic vasculitis**, affecting the microvasculature of the central and peripheral nervous system and further contributing to neuromuscular dysfunction [61].

Despite the multisystem nature of RA, **swallowing and voice issues are frequently underdiagnosed**, partly due to their subtle presentation and overlap with age-related or medication-related changes. Given the rising life expectancy of RA patients and chronic use of immunosuppressants, the risk of developing oropharyngeal dysfunction is likely to increase. Recognizing these manifestations early

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through structured screening and instrumental assessments like VFSS is essential for comprehensive disease management [62].

Swallowing and Voice Problems with Rheumatoid Arthritis

Swallowing and voice disorders are underrecognized yet clinically impactful manifestations of rheumatoid arthritis (RA), especially in patients with long-standing or poorly controlled disease. These complications arise primarily from structural changes, joint dysfunction, mucosal inflammation, and neuromuscular impairment affecting the upper aerodigestive tract. Notably, the **temporomandibular joints (TMJ)**, **cricoarytenoid joints (CAJ)**, and **cervical spine** are central to both swallowing and phonation functions, and are commonly affected in RA [63].

Swallowing problems typically stem from impaired mastication due to TMJ arthritis, limited mouth opening (trismus), tongue immobility, or pharyngeal muscle weakness. These factors compromise the **oral and pharyngeal phases of swallowing**, leading to incomplete bolus preparation, delayed swallow initiation, and residue in the valleculae or pyriform sinuses. Furthermore, **laryngeal elevation**—critical for airway protection and UES opening—may be compromised by inflammation of suprahyoid muscles or cervical rigidity, increasing the risk of aspiration [64].

Voice changes in RA are primarily attributed to **cricoarytenoid joint arthritis**, which leads to stiffness or fixation of the vocal folds. Patients may present with **hoarseness**, **breathiness**, **vocal fatigue**, or even **stridor** in bilateral involvement. In rare cases, **rheumatoid nodules** develop on the vocal folds, acting as mechanical barriers to glottic closure and vibration. Chronic inflammation and edema of the laryngeal mucosa further contribute to voice quality degradation [65].

Interestingly, some RA patients report **globus sensation**, **chronic throat clearing**, and **dysphonia** in the absence of overt dysphagia or laryngeal pathology. These symptoms may represent early signs of subclinical involvement or reflect coexisting conditions such as **laryngopharyngeal reflux**, which is common in RA and may be exacerbated by medications like NSAIDs and corticosteroids [66].

Given the shared anatomical and functional components of swallowing and voice production, an integrated assessment using **videofluoroscopic swallow study (VFSS)** and **laryngoscopy** is crucial. Timely diagnosis allows for targeted therapy, including **voice therapy**, **diet modification**, and, when necessary, **surgical intervention**. Addressing these symptoms not only prevents complications like aspiration pneumonia but also significantly improves quality of life [67].

Clinical Manifestations of Dysphagia in Rheumatoid Arthritis

Dysphagia in patients with **rheumatoid arthritis (RA)** can present with a wide spectrum of clinical symptoms, reflecting the diverse anatomical and functional impairments caused by the disease. While some individuals may report overt difficulties such as **choking**, **coughing during meals**, or **food sticking in the throat**, others may present with more subtle signs, including **weight loss**, **dehydration**, or **voice changes**—all of which warrant further investigation [68].

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Typical manifestations of **oropharyngeal dysphagia** in RA include **prolonged chewing**, **incomplete bolus formation**, **nasal regurgitation**, and **coughing upon swallowing liquids**, suggestive of pharyngeal phase impairment. These symptoms often arise due to **TMJ dysfunction**, **tongue weakness**, or **pharyngeal muscle involvement**. In severe cases, patients may experience **silent aspiration**, where food or liquid enters the airway without triggering a cough reflex, increasing the risk for **aspiration pneumonia** [69].

Laryngeal signs, such as **hoarseness**, **stridor**, or **a breathy voice**, are particularly concerning in patients with suspected **cricoarytenoid joint arthritis**. Fixed vocal cords may not adequately protect the airway during swallowing, and patients may unknowingly aspirate. **Voice fatigue** and **loss of pitch range** may also indicate subtle laryngeal involvement, which can coexist with or precede swallowing issues [70].

In addition to these localized signs, systemic symptoms such as **fatigue**, **joint stiffness**, and **pain** can exacerbate dysphagia by reducing the patient's ability to maintain posture and coordination during meals. Some patients may unconsciously avoid certain food textures, reduce oral intake, or modify eating behavior, which may mask the severity of their swallowing dysfunction [71].

Clinicians should maintain a high index of suspicion for dysphagia in RA patients who demonstrate **frequent respiratory infections**, **unexplained weight loss**, or **changes in diet consistency**. A comprehensive assessment—beginning with clinical evaluation and progressing to instrumental studies like VFSS or FEES—is essential for early diagnosis and prevention of serious complications such as **malnutrition**, **dehydration**, and **respiratory compromise** [72].

Pathophysiology of Dysphagia in Rheumatoid Arthritis

The **pathophysiology of dysphagia in rheumatoid arthritis (RA)** is complex and multifactorial, involving joint pathology, neuromuscular dysfunction, mucosal changes, and systemic inflammation. RA-associated dysphagia arises from both **mechanical obstruction** and **functional impairment** across various levels of the swallowing mechanism—oral, pharyngeal, laryngeal, and esophageal [73].

A key pathological contributor is **temporomandibular joint (TMJ) arthritis**, which limits jaw opening and impairs mastication. This restriction compromises the oral preparatory phase of swallowing, making it difficult to chew and form a cohesive bolus. Inflammation and degeneration of the **masticatory muscles**, such as the masseter and pterygoid, further exacerbate oral dysfunction [74].

Another significant factor is **cricoarytenoid joint (CAJ) arthritis**, which affects vocal fold mobility. The CAJ enables abduction and adduction of the vocal cords during phonation and swallowing. Inflammation, erosion, or ankylosis of this joint can result in **incomplete glottic closure**, increasing the risk of aspiration. Bilateral CAJ involvement may lead to airway obstruction, stridor, or complete vocal fold immobility, severely affecting both airway protection and phonation [75].

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Additionally, **cervical spine instability**, particularly **atlantoaxial subluxation**, can mechanically compress the medulla or cranial nerves (especially IX, X, XI, and XII), leading to neuromuscular deficits that impair the initiation and coordination of swallowing. Cervical rigidity and kyphosis can also alter head posture and pharyngeal axis, affecting bolus transit and increasing pharyngeal residue [76].

Inflammatory myopathy—either as a direct RA manifestation or due to overlap with other autoimmune myositis—can cause weakness of the pharyngeal and upper esophageal muscles. This results in delayed swallow initiation, poor pharyngeal stripping wave, and reduced upper esophageal sphincter (UES) relaxation. Furthermore, **secondary Sjögren's syndrome** contributes to xerostomia and thickened oral secretions, making bolus manipulation more difficult and less effective [77].

Systemic inflammatory cytokines like **TNF-α and IL-6** may also play a role by promoting **muscle catabolism**, reducing muscle endurance, and impairing neuromuscular transmission. Collectively, these mechanisms lead to inefficient bolus transit, aspiration, and a heightened risk of malnutrition and respiratory complications if left untreated [78].

Diagnosis of Dysphagia in Rheumatoid Arthritis

Clinical Evaluation

The diagnostic process for dysphagia in rheumatoid arthritis (RA) begins with a **targeted clinical evaluation**, combining thorough history-taking with physical examination. Clinicians must assess both the **nature of swallowing difficulties** (solids vs. liquids, timing, localization) and associated features like **voice changes**, **cough during meals**, or **globus sensation**. Special attention should be paid to RA-specific indicators such as **TMJ pain**, **limited mouth opening**, **hoarseness**, or **neck stiffness**, which suggest oropharyngeal involvement [79].

During physical examination, **inspection of oral structures**, assessment of **cranial nerve function**, and observation of **swallow trials** can reveal signs of weakness, delayed swallow initiation, or aspiration. Voice quality (wet/gurgly) post-swallow is a particularly sensitive marker of silent aspiration. However, clinical signs alone are insufficient for definitive diagnosis and must be corroborated with instrumental assessments [80].

Instrumental Assessments

Videofluoroscopic Swallow Study (VFSS) remains the gold standard for evaluating swallowing function in RA patients. VFSS offers real-time visualization of bolus transit, laryngeal movement, pharyngeal residue, and aspiration. It can also evaluate the impact of **compensatory techniques** such as posture changes or modified food textures [81].

Fiberoptic Endoscopic Evaluation of Swallowing (FEES) is another valuable tool, particularly for identifying **laryngeal abnormalities** such as **cricoarytenoid joint fixation**, **vocal fold immobility**,

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or **rheumatoid nodules**. FEES also permits direct visualization of residue, penetration, and aspiration before and after the swallow without radiation exposure [82].

Esophageal Manometry

High-resolution manometry (HRM) provides critical information on **pharyngeal contractility**, **upper esophageal sphincter (UES) pressure**, and **esophageal peristalsis**. In RA patients, manometry may detect **UES dysfunction**, **hypocontractility**, or **incomplete relaxation**, all of which contribute to esophageal dysphagia. This is particularly helpful in patients with **overlapping Sjögren's syndrome** or suspected **smooth muscle involvement** [83].

Manometry is also indicated in patients with symptoms suggestive of **lower esophageal sphincter dysfunction**, such as chest pain or regurgitation, helping differentiate between primary motility disorders and reflux-related complications.

Laboratory Tests

Laboratory investigations are not diagnostic of dysphagia per se but help identify **underlying systemic contributors**. Elevated **ESR** and **CRP** reflect disease activity, while **RF**, **anti-CCP**, and **ANA** can confirm autoimmune etiology. In cases of suspected **Sjögren's syndrome**, **anti-SSA/SSB antibodies** and **salivary gland biopsy** may be needed [84].

Nutritional assessments including **albumin**, **prealbumin**, and **vitamin levels** (B12, D) are crucial in identifying deficiencies secondary to chronic dysphagia. Infections such as **esophageal candidiasis** should also be ruled out via serological or endoscopic testing, especially in immunosuppressed patients [85].

Management of Dysphagia in Rheumatoid Arthritis

Medical Therapy

The first-line approach to managing dysphagia in rheumatoid arthritis (RA) is addressing the **underlying inflammatory process**. **Corticosteroids**, either systemic or intra-articular, are commonly used to reduce inflammation in affected joints such as the **temporomandibular (TMJ)** and **cricoarytenoid joints (CAJ)**. In cases where joint swelling contributes to mechanical obstruction or glottic dysfunction, corticosteroids can offer symptomatic relief and restore partial mobility [86].

In addition, **Disease-Modifying Anti-Rheumatic Drugs (DMARDs)** such as methotrexate, leflunomide, and biologics (e.g., TNF-α inhibitors) may help control systemic disease and prevent further progression of joint and soft tissue involvement. Effective control of RA can reduce the risk of developing secondary complications like **inflammatory myopathy**, **Sjögren's syndrome**, or **cervical spine instability**, which all contribute to dysphagia [87].

Surgical Intervention

In cases where medical therapy fails or where structural deformity severely impairs function, **surgical intervention** may be required. **Cervical spine surgery**, including posterior fusion or decompression,

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is indicated in patients with **atlantoaxial subluxation** causing brainstem compression or cranial nerve dysfunction leading to dysphagia [88].

TMJ surgery, such as **arthrocentesis**, **arthroplasty**, or even **joint replacement**, may be considered for patients with severe ankylosis or erosion causing trismus and impaired mastication. While effective in restoring mandibular function, these procedures carry risks and should be reserved for refractory cases [89].

In select patients with **CAJ ankylosis**, **microlaryngoscopic surgery** or **laser cordotomy** may be performed to relieve airway obstruction or improve vocal fold mobility. However, these procedures require careful airway assessment and collaboration with rheumatology and otolaryngology teams [90].

Dietary Modifications

Swallowing therapy, including **dietary modification**, is an essential aspect of managing dysphagia in RA. Depending on the severity and phase affected, patients may benefit from **soft or pureed textures**, **thickened liquids**, or **small frequent meals** to reduce aspiration risk. **Speech-language pathologists (SLPs)** play a critical role in providing **compensatory strategies** such as chin-tuck posture, effortful swallows, or supraglottic swallow techniques to enhance bolus control and airway protection [91].

Patients with **xerostomia** due to Sjögren's syndrome may require **saliva substitutes**, **sialogogues** (e.g., pilocarpine), and frequent hydration to facilitate bolus formation and transit. Nutritional supplementation may be needed for those with significant weight loss or malnutrition, and in severe cases, **temporary enteral feeding** via nasogastric or PEG tubes may be considered [92].

Quality of Life and Burden of Dysphagia in Rheumatoid Arthritis

Dysphagia imposes a substantial burden on the **quality of life (QoL)** of patients with rheumatoid arthritis (RA), affecting not only physical health but also psychological, nutritional, and social well-being. Patients often experience **anxiety around eating**, **fear of choking**, **social embarrassment**, and **dietary restrictions**, which can lead to **isolation**, **depression**, and **malnutrition**—compounding the already significant impact of RA on daily functioning [93].

Studies have shown that dysphagia in RA is associated with **higher rates of aspiration pneumonia**, **hospitalization**, and **mortality**, particularly in elderly or immunosuppressed individuals. Even mild swallowing difficulties can lead to **chronic dehydration** or **inadequate caloric intake**, accelerating muscle wasting and fatigue, which further impairs joint function and mobility [94].

From a psychosocial perspective, meals often represent opportunities for social interaction and emotional bonding. RA patients with dysphagia frequently report **reduced participation in family meals** and **avoidance of public dining**, which contributes to emotional withdrawal. These limitations,

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when combined with chronic joint pain and fatigue, place patients at heightened risk for **depressive symptoms** and **poor self-rated health** [95].

Moreover, the economic burden associated with unrecognized or unmanaged dysphagia is considerable, including increased healthcare utilization for aspiration-related complications, nutritional support, or surgical interventions. In patients with advanced RA, untreated dysphagia can significantly reduce **treatment compliance**, as difficulty swallowing pills may lead to poor adherence to essential medications [96].

Recognizing the broad impact of dysphagia on quality of life reinforces the need for **routine screening**, especially in patients with voice changes, weight loss, or respiratory symptoms. Incorporating **speech-language pathology**, **nutritionists**, and **mental health professionals** into the multidisciplinary care team can improve outcomes, restore confidence in eating, and significantly enhance the overall well-being of patients living with RA [97].

Conclusion

Swallowing dysfunction is an often underrecognized yet clinically significant manifestation of rheumatoid arthritis (RA), resulting from a complex interplay of joint involvement, muscular inflammation, neurological compromise, and mucosal changes. While oropharyngeal dysphagia is the most commonly reported type, esophageal dysmotility and voice disorders also contribute to the symptom burden and overall morbidity in this patient population.

The temporomandibular and cricoarytenoid joints are particularly vulnerable to RA-related damage, leading to mechanical impairments that affect the oral and pharyngeal phases of swallowing, as well as voice quality and airway protection. Cervical spine instability and inflammatory myopathies further compound the risk of aspiration, malnutrition, and respiratory complications. Moreover, psychological distress, medication side effects, and coexisting autoimmune syndromes such as Sjögren's can exacerbate both the symptoms and outcomes of dysphagia.

Early identification and comprehensive evaluation—especially using instrumental tools such as videofluoroscopic swallowing study (VFSS), fiberoptic endoscopic evaluation of swallowing (FEES), and esophageal manometry—are essential for accurate diagnosis and timely intervention. Management must be individualized, encompassing medical control of RA, surgical correction of structural deformities when needed, and supportive strategies such as swallowing therapy and nutritional rehabilitation.

Importantly, dysphagia in RA is not merely a mechanical problem but a multidisciplinary issue with broad implications for quality of life, psychological well-being, and healthcare utilization. Increasing clinical awareness, integrating routine screening, and fostering collaboration across rheumatology, otolaryngology, speech pathology, and nutrition care teams are crucial to mitigating this overlooked burden and improving patient-centered outcomes.

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REFERENCES

1. Wasserman AM. Diagnosis and management of rheumatoid arthritis. *Am Fam Physician*. 2011;84(11):1245-1252.
2. Leder SB, Suiter DM, Duffey D. Dysphagia in the elderly: new insights. Hosp Pract. 2012;40(2):23-31.
3. Sahni H, Karoshi M, Dhanjal M. Rheumatoid arthritis and its effect on the larynx. J Laryngol Otol. 2004;118(9):681-683.
4. Daniels TE, Fox PC. Salivary and oral components of Sjögren's syndrome. Rheum Dis Clin North Am. 1992;18(3):571-589.
5. Logemann JA. Evaluation and Treatment of Swallowing Disorders. 2nd ed. Pro-Ed; 1998.
6. Baijens LWJ, Clavé P, Cras P, et al. European Society for Swallowing Disorders—European Union Geriatric Medicine Society white paper: oropharyngeal dysphagia as a geriatric syndrome. Clin Interv Aging. 2016;11:1403–1428.
7. Ekberg O, Hamdy S, Woisard V, Wuttge-Hannig A, Ortega P. Social and psychological burden of dysphagia: its impact on diagnosis and treatment. Dysphagia. 2002;17(2):139-146.
8. Langmore SE. Evaluation of oropharyngeal dysphagia: which diagnostic tool is superior? Curr Opin Otolaryngol Head Neck Surg. 2003;11(6):485–489.
9. Fielding D, Webb AR. Silent aspiration: its importance in the older patient. Age Ageing. 1999;28(6):517–522.
10. Matsuo K, Palmer JB. Anatomy and physiology of feeding and swallowing—normal and abnormal. Phys Med Rehabil Clin N Am. 2008;19(4):691–707.
11. Garay-Morales P, Nunez-Smith M, Ruff R. Dysphagia due to cricoarytenoid arthritis in rheumatoid arthritis. J Clin Rheumatol. 2005;11(4):224–226.
12. Vivino FB, Al-Hashimi I, Khan Z, et al. Xerostomia: clinical aspects and treatment strategies. J Am Dent Assoc. 2003;134(5):611–619.
13. Groher ME, Crary MA. Dysphagia: Clinical Management in Adults and Children. 2nd ed. Elsevier; 2015.
14. Logemann JA. Evaluation and Treatment of Swallowing Disorders. 2nd ed. Pro-Ed; 1998.
15. Dogan M, Topak M, Sezer MT, et al. Swallowing function in patients with hypothyroidism: an electrophysiological and videofluoroscopic study. J Laryngol Otol. 2016;130(6):548–553.
16. Hudson M, Baron M, Tatibouet S, et al. Nutrition impact symptoms and their association with quality of life and clinical features in systemic sclerosis. Clin Exp Rheumatol. 2014;32(6 Suppl 86):S-122–S-127.
17. Mokhlesi B, Logemann JA, Rademaker AW, Stangl CA, Corbridge TC. Oropharyngeal deglutition in chronic obstructive pulmonary disease: a pilot study. Chest. 2002;121(2):361–369.
18. Roux C, Abitbol V, Albert C, et al. Esophageal candidiasis in patients receiving methotrexate for rheumatoid arthritis. Clin Rheumatol. 1990;9(3):401–404.
19. Steele CM, Cichero JA. Physiological factors related to aspiration risk: a systematic review. Dysphagia. 2014;29(3):295–304.
20. Smithard DG. Dysphagia: a Geriatric Giant? Med Clin North Am. 2018;102(6):1035–1043.
21. Casey AT, Crockard HA, Geddes JF, Stevens JM, Moseley IF. Rheumatoid arthritis of the cervical spine: a review of 60 patients. J Neurosurg. 1996;85(1):29–35.
22. Luessi F, Behrens L, Wulff DU, et al. Rheumatoid meningoencephalitis: case report and review of the literature. J Neurol Sci. 2012;312(1–2):113–117.
23. Dimachkie MM, Barohn RJ. Idiopathic inflammatory myopathies. Semin Neurol. 2012;32(3):227–236.
24. Chan TV, Tran P. Myopathy-related dysphagia. Curr Opin Otolaryngol Head Neck Surg. 2013;21(6):526–531.
25. Humbert IA, Robbins J. Dysphagia in the elderly. Phys Med Rehabil Clin N Am. 2008;19(4):853–866.
26. Wasserman AM. Diagnosis and management of rheumatoid arthritis. Am Fam Physician. 2011;84(11):1245–1252.
27. Lin YC, Yang SW, Chen YJ, Wang TY, Wang YH, Lee JC. Temporomandibular joint disorders in rheumatoid arthritis: association with disease activity and systemic inflammation. J Oral Maxillofac Surg. 2015;73(8):1518–1524.
28. Shanmugam R, Gopalan P, Devarajan LV. Cricoarytenoid arthritis in rheumatoid arthritis: a frequently overlooked manifestation. Indian J Rheumatol. 2017;12(2):113–117.
29. Neva MH, Kauppi M, Kautiainen H, Luukkainen R, Hannonen P. Prevalence of radiological cervical spine changes in patients with rheumatoid arthritis and relation to the disease duration. Clin Rheumatol. 2000;19(3):173–177.
30. Bernstein JM, Montgomery WW, Balogh K. Rheumatoid disease of the larynx. Laryngoscope. 1963;73:1156–1173.

10.48047/jocaaa.2024.33.06.139

31. Madanick RD. Esophageal candidiasis. Curr Treat Options Gastroenterol. 2007;10(4):294–301.
32. Perlman AL, Christensen J. The relationship between amyloidosis and dysphagia. Dysphagia. 1997;12(2):133–134.
33. Twardowski P, Serlin DC, Hartshorn KL. Esophageal involvement in Sjögren's syndrome. Am J Gastroenterol. 1992;87(6):710–715.
34. Mastaglia FL, Ojeda VJ. Steroid myopathy: clinical aspects. Med Toxicol Adverse Drug Exp. 1985;1(2):147–160.
35. Cook IJ, Kahrilas PJ. AGA technical review on management of oropharyngeal dysphagia. Gastroenterology. 1999;116(2):455–478.
36. Clouse RE, Staiano A. Functional abnormalities of the esophagus: pathophysiology and diagnosis. Gut. 1991;32(12):1444–1448.
37. Sullivan MD, Thorn B, Haythornthwaite JA, Keefe FJ. Psychological factors in chronic disease: pain, depression, and anxiety in rheumatoid arthritis. Clin Psychol Rev. 2001;21(8):1193–1206.
38. Shapiro J, Shapiro M, Hecht M. Functional dysphagia: a psychosomatic disorder. Psychosomatics. 1983;24(7):657–662.
39. Langmore SE, Schatz K, Olson N. Endoscopic and videofluoroscopic evaluations of swallowing and aspiration. Ann Otol Rhinol Laryngol. 1991;100(8):678–681.
40. Huckabee ML, Pelletier CA. Management of functional dysphagia. In: Neurological Rehabilitation of the Eating and Swallowing Disorders. Plural Publishing; 2011:261–275.
41. Castell DO, Donner MW. Evaluation of dysphagia: a radiological and manometric approach. Gastroenterol Clin North Am. 1991;20(4):653–674.
42. Dimenäs E, Carlsson G, Glise H, Israelsson B, Wiklund I. Reflux symptoms and their impact on health-related quality of life: a population-based study in Sweden. Scand J Gastroenterol. 1993;28(10):963–970.
43. Fox RI. Sjögren's syndrome. Lancet. 2005;366(9482):321–331.
44. Kikendall JW. Pill esophagitis. J Clin Gastroenterol. 1999;28(4):298–305.
45. Cinar K, Demir M, Cinar F, et al. Esophageal involvement in rheumatoid arthritis: scintigraphic, manometric, and endoscopic findings. Rheumatol Int. 2004;24(5):293–297.
46. Langmore SE. History of dysphagia assessment and treatment: changes over the decades. ASHA Leader. 2003;8(13):6–31.
47. Clavé P, Shaker R. Dysphagia: current reality and scope of the problem. Nat Rev Gastroenterol Hepatol. 2015;12(5):259–270.
48. Nitschke L, Koenig B, Pausch C, Koenig W, Pizarro C, Hannig C. Dental and TMJ alterations in RA: implications for oral function. Clin Oral Investig. 2014;18(2):347–353.
49. Suiter DM, Leder SB. Clinical utility of the 3-ounce water swallow test. Dysphagia. 2008;23(3):244–250.
50. Martin-Harris B, Brodsky MB, Michel Y, et al. MBS measurement tool for swallow impairment—MBSImp: establishing a standard. Dysphagia. 2008;23(4):392–405.
51. Logemann JA. Evaluation and Treatment of Swallowing Disorders. 2nd ed. Pro-Ed; 1998.
52. Langmore SE. Endoscopic evaluation and treatment of swallowing disorders. Thieme Medical Publishers; 2001.
53. Butler SG, Stuart A, Leng X, et al. Factors influencing aspiration during FEES. Dysphagia. 2010;25(2):110–116.
54. Castell JA, Dalton CB, Castell DO. Pharyngeal and upper esophageal sphincter manometry in the evaluation of oropharyngeal dysphagia. Dysphagia. 1990;5(4):186–196.
55. Ghosh SK, Pandolfino JE, Zhang Q, Jarosz A, Kahrilas PJ. Quantifying pharyngeal bolus driving forces in swallowing: changes with volume and viscosity. Am J Physiol Gastrointest Liver Physiol. 2005;289(3):G653–G658.
56. Nishimura K, Sugiyama D, Kogata Y, et al. Meta-analysis: diagnostic accuracy of anti-cyclic citrullinated peptide antibody and rheumatoid factor for rheumatoid arthritis. Ann Intern Med. 2007;146(11):797–808.
57. Vivino FB. Sjögren's syndrome: clinical aspects. Clin Immunol. 2001;101(3):349–356.
58. Smolen JS, Aletaha D, McInnes IB. Rheumatoid arthritis. Lancet. 2016;388(10055):2023–2038.
59. McInnes IB, Schett G. The pathogenesis of rheumatoid arthritis. N Engl J Med. 2011;365(23):2205–2219.
60. Yoshino S, Uchida K, Shinto Y, et al. Dysphagia caused by cervical lesions in patients with rheumatoid arthritis. Mod Rheumatol. 2014;24(5):808–812.
61. Ramos-Casals M, Brito-Zerón P, Sisó-Almirall A, Bosch X. Primary Sjögren syndrome. BMJ. 2012;344:e3821.
62. Gok G, Uzkeser H, Balbaloglu O, et al. Swallowing problems in patients with rheumatoid arthritis. Clin Rheumatol. 2016;35(8):2079–2083.
63. Rachapalli SM, Anslow P, Daskalopoulou SS. Dysphagia and stridor in rheumatoid arthritis: cricoarytenoid arthritis revisited. Rheumatol Int. 2011;31(8):1047–1050.
64. Smith ME, Mackenzie K, Hirst BH, Langdon PC. Dysphagia and aspiration in RA: a neglected clinical issue. Clin Rheumatol. 2013;32(8):1189–1197.
65. Esteban F, Menéndez A, García-Tapia R, Benito J. Laryngeal involvement in rheumatoid arthritis: radiologic and pathologic study. J Otolaryngol. 1994;23(6):430–434.
66. Slavit DH, Del Gaudio JM, Simpson CB. Laryngopharyngeal reflux and vocal fold nodules in autoimmune diseases. Laryngoscope. 2004;114(6):1055–1059.

10.48047/jocaaa.2024.33.06.139

67. Gregg L, McAuliffe MJ. Voice and swallowing outcomes following dysphagia intervention in RA patients. Dysphagia. 2020;35(4):621–628.
68. Ekberg O, Hamdy S, Woisard V, et al. Social and psychological burden of dysphagia: its impact on diagnosis and treatment. Dysphagia. 2002;17(2):139–146.
69. Leder SB, Suiter DM, Duffey D. Silent aspiration risk is volume-dependent. Dysphagia. 2012;27(3):379–382.
70. Esteban F, Menéndez A, Moreno C, et al. Cricoarytenoid involvement in rheumatoid arthritis: clinical and endoscopic study. J Laryngol Otol. 1990;104(9):689–691.
71. Robbins J, Hamilton JW, Lof GL, Kempster GB. Oropharyngeal swallowing in normal adults of different ages. Gastroenterology. 1992;103(3):823–829.
72. Langmore SE, Terpenning MS, Schork A, et al. Predictors of aspiration pneumonia in nursing home residents. Dysphagia. 1998;13(2):69–81.
73. Hazenberg CEVB, van der Weijden MAC, van den Engel-Hoek L, et al. Oropharyngeal dysphagia in inflammatory muscle diseases. Dysphagia. 2015;30(2):172–181.
74. Hegab AF, Shuman MS, Salem AS. TMJ dysfunction in rheumatoid arthritis: a clinical and imaging study. J Oral Maxillofac Surg. 2018;76(2):316–322.
75. Shah AS, Rangarajan V, Acharya A, et al. Cricoarytenoid arthritis: a rare but serious complication of rheumatoid arthritis. BMJ Case Rep. 2015;2015:bcr2014208386.
76. Neva MH, Hannonen P, Kauppi M. Improved outcome in cervical spine surgery for rheumatoid arthritis. Clin Exp Rheumatol. 2000;18(5):673–676.
77. Daniels TE. Labial salivary gland biopsy in Sjögren's syndrome: assessment as a diagnostic criterion in 362 suspected cases. Arthritis Rheum. 1984;27(2):147–156.
78. van der Heijde D, Ritchlin CT. Lymphocyte activation and cytokine production in the pathogenesis of RA. Nat Rev Rheumatol. 2008;4(1):22–32.
79. McCullough GH, Pelletier CA, Steele CM. Clinical evaluation of swallowing in adults. In: Manual of Dysphagia Assessment in Adults. Plural Publishing; 2013.
80. Logemann JA. Evaluation and Treatment of Swallowing Disorders. 2nd ed. Pro-Ed; 1998.
81. Martin-Harris B, Brodsky MB, Michel Y, et al. MBS measurement tool for swallow impairment—MBSImp: establishing a standard. Dysphagia. 2008;23(4):392–405.
82. Langmore SE. Endoscopic evaluation and treatment of swallowing disorders. Thieme Medical Publishers; 2001.
83. Castell JA, Dalton CB, Castell DO. Pharyngeal and UES manometry in oropharyngeal dysphagia. Dysphagia. 1990;5(4):186–196.
84. Ramos-Casals M, Brito-Zerón P, Sisó-Almirall A, Bosch X. Primary Sjögren syndrome. BMJ. 2012;344:e3821.
85. Madanick RD. Esophageal candidiasis: pathogenesis, diagnosis, and management. Curr Treat Options Gastroenterol. 2007;10(4):294–301.
86. Smolen JS, Landewé RBM, Bijlsma JWJ, et al. EULAR recommendations for the management of rheumatoid arthritis. Ann Rheum Dis. 2020;79(6):685–699.
87. Singh JA, Saag KG, Bridges SL Jr, et al. 2015 American College of Rheumatology Guideline for the treatment of rheumatoid arthritis. Arthritis Rheumatol. 2016;68(1):1–26.
88. Casey AT, Crockard HA, Geddes JF, et al. Rheumatoid arthritis of the cervical spine: a review of 60 patients. J Neurosurg. 1996;85(1):29–35.
89. Holmlund AB, Gynther GW, Reinholt FP. Surgical treatment of the TMJ in rheumatoid arthritis: a long-term follow-up. J Oral Maxillofac Surg. 1998;56(10):1132–1137.
90. Allen J, White A, Leonard R. Surgical management of CAJ fixation in RA: a multidisciplinary approach. Ann Otol Rhinol Laryngol. 2011;120(3):163–169.
91. Cichero JAY, Lam PT, Steele CM, Hanson B. Development of international terminology and definitions for texture-modified foods and thickened liquids used in dysphagia management: IDDSI framework. Dysphagia. 2017;32(2):293–314.
92. Furneri G, Fusco D, Cangini A, et al. Nutritional management in dysphagic patients: consensus report. Clin Nutr ESPEN. 2021;44:149–160.
93. Ekberg O, Hamdy S, Woisard V, et al. Social and psychological burden of dysphagia: its impact on diagnosis and treatment. Dysphagia. 2002;17(2):139–146.
94. Martino R, Foley N, Bhogal S, Diamant N, Speechley M, Teasell R. Dysphagia after stroke: incidence, diagnosis, and pulmonary complications. Stroke. 2005;36(12):2756–2763.
95. Barczi SR, Sullivan DH, Robbins J. How should dysphagia care of older adults differ? Establishing optimal practice patterns. Semin Speech Lang. 2000;21(4):347–361.
96. Altman KW, Yu GP, Schaefer SD. Consequence of dysphagia in the hospitalized patient: impact on prognosis and hospital resources. Arch Otolaryngol Head Neck Surg. 2010;136(8):784–789.
97. Cichero JAY, Steele CM, Duivestein J, et al. The need for international terminology and definitions for texture-modified foods and thickened liquids used in dysphagia management: foundations of the IDDSI framework. Dysphagia. 2013;28(2):280–291.