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Original Research Article

Parameters of the assessment of voice quality and clinical manifestation of rheumatoid arthritis

Bożena Kosztyła-Hojna [a], Diana Moskal [a,*], Anna Kuryliszyn-Moskal [b]

[a] Department of Clinical Phonoaudiology and Logopedics, Medical University of Bialystok, Bialystok, Poland
[b] Department of Rehabilitation, Medical University of Bialystok, Bialystok, Poland

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ABSTRACT

Purpose: The aim of the study was to investigate the voice quality parameters in 72 rheumatoid arthritis (RA) patients and their relationships with the clinical manifestations and disease activity. The control group consisted of 30 healthy subjects.
Material and methods: All RA patients were evaluated by extensive clinical, laboratory and radiographic studies. The phoniatric assessment included the analysis of vocal folds vibrations by digital stroboscopy (DS) of the larynx using HRES ENDOCAM 5562 system, digital kymography (DKG) and High-Speed Digital Imaging (HSDI) technique. The acoustic voice analysis was conducted using DiagnoScope Specialist program.
Results: Voice quality disorders were registered in 32 (44.44%) RA patients and observed more frequently in patients with moderate and severe activity (DAS28 $\geq$ 3.2) than in mild RA. In digital stroboscopy, confirmed by digital kymography, the hypofunctional dysphonia was observed especially in patients with DAS28 $\geq$ 3.2. Outcomes of the subjective assessment of voice quality were in accordance with the objective parameters and acoustic voice examination.
Conclusions: In RA patients the most frequent voice quality disorders with hypofunctional dysphonia were registered. The relationships between voice quality disorders, clinical activity and radiographic progression of RA patients were observed. Digital stroboscopy, digital kymography, High-Speed Digital Imaging and acoustic voice analysis used in the complex diagnosis of RA confirmed the presence of pathological changes in the larynx. There is a need of cooperation between rheumatologists and phoniatricians in the diagnosis and treatment of dysphonia in RA patients.

1. Introduction

Rheumatoid arthritis (RA) is a chronic, inflammatory autoimmune disease leading to joint damage and bone destruction. Progressive and persistent joint inflammation is associated with a broad spectrum of extra-articular manifestations ranging from subclinical or mild symptoms to rare but serious organ dysfunction. Laryngeal manifestations of RA involve intrinsic muscles of the larynx, joints and laryngeal cartilages, especially cricoarytenoid joints which play a crucial role in the process of phonation [1–3]. Inflammatory changes in intrinsic muscles of the larynx and cricoarytenoid joints may result in voice quality disorders called dysphonia.

Results of many studies show that frequency of voice quality disorders in patients with RA ranged from 12% to 27%, whereas in healthy subjects it varied from 3% to 8% [4,5]. Moreover, voice disorders were observed also in the course of other autoimmune diseases such as systemic lupus erythematosus (SLE) and Sjögren syndrome (SS) [3,6–10]. However, only few authors have focused on the relationship between clinical manifestation of the disease and voice pathology in patients with RA [1,11,12]. Results of many investigations base on the subjective phoniatric assessment or refer to the analysis of quality of life in RA patients [5,10,11]. However, only few studies use objective methods of voice quality assessment [1,13].

Application of modern methods of vocal folds visualization in objective diagnosis of voice quality impairment [14–18] became an inspiration to investigate the voice quality parameters in RA patients and their relationships with clinical manifestations and disease activity. Therefore, the aim of this study was a complex assessment of voice quality parameters in RA patients using

* Corresponding author at: Department of Clinical Phonoaudiology and Logopedics, Medical University of Bialystok, Szpitalna 37, 15-295 Bialystok, Poland. Tel.: +48 85 748 56 52; fax: +48 85 748 56 51.
E-mail address: diana.moskal@umb.edu.pl (D. Moskal).

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perceptual voice analysis, objective methods of vocal folds visualization, acoustic voice analysis and examination of maximum phonation time (MPT), due to the clinical manifestation of the disease.

2. Material and methods

2.1. Patients and controls

The study was carried out in 72 patients with RA, defined according to revised criteria of the American College of Rheumatology (ACR) [19], treated in the Department of Rehabilitation of the Medical University of Bialystok and diagnosed in the Department of Clinical Phonoaudiology and Logopedics of the Medical University of Bialystok, Poland. The group consisted of 54 (75%) female and 18 (25%) male patients, aged from 27 to 76 years (mean 59.6 years). Duration of the disease ranged from 3 months to 28 years (mean 11.6 years). All patients were receiving disease-modifying anti-rheumatic drugs (DMARDs) (62 subjects – methotrexate (MTX), 4-sulphasalazine and 6-leflunomide). All patients were not treated with prednisolone or biologic drugs at the time of the study.

The control group consisted of 30 healthy subjects, 22 (73.3%) female and 8 (26.7%) male patients, aged from 30 to 65 years (mean 57.5 years) without pathological changes of voice quality. The group included non-smokers, non-professional voice working persons, without features of gastroesophageal reflux.

All participants gave written informed consent for all procedures. The protocols were approved by the Ethical Committee of the Medical University of Bialystok and adhered to the tenets of the Helsinki Declaration.

2.2. Clinical evaluation

Patients with RA were referred by rheumatologist to phoniatrician during their examination, where they spontaneously complained of symptoms connected with voice quality disorders. Subjective examination was carried out on the basis of precise phoniatric interview.

Rheumatological evaluation of RA patients included clinical examination, assessment of the disease activity using Disease Activity Score (DAS28) covering 28 joints (tenderness and swelling in 28 joints, global visual analog scale – VAS with assessment range 0–10 and concentration of C-reactive protein – CRP) [20], hemoglobin, platelet counts, urine analysis, serum creatinine, urinary protein excretion. Radiological stages of the disease were scored according to Steinbrocker method with a global damage score to hands, wrists and feet using a four-point scale from I – minimal damage (juxta-articular osteopenia or soft tissue swelling) to IV – severe damage (joint destruction, either lysis or ankylosis).

The phoniatric assessment was carried out using subjective and objective methods. In the phoniatric evaluation of phonatory organ, the subjective examination – phoniatric anamnesis was

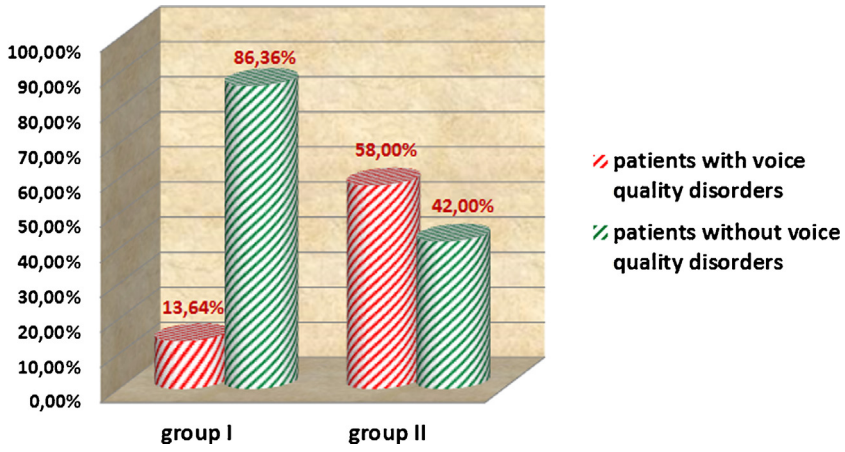

Fig. 1. The presence of voice quality disorders and depending on the disease activity in RA patients.

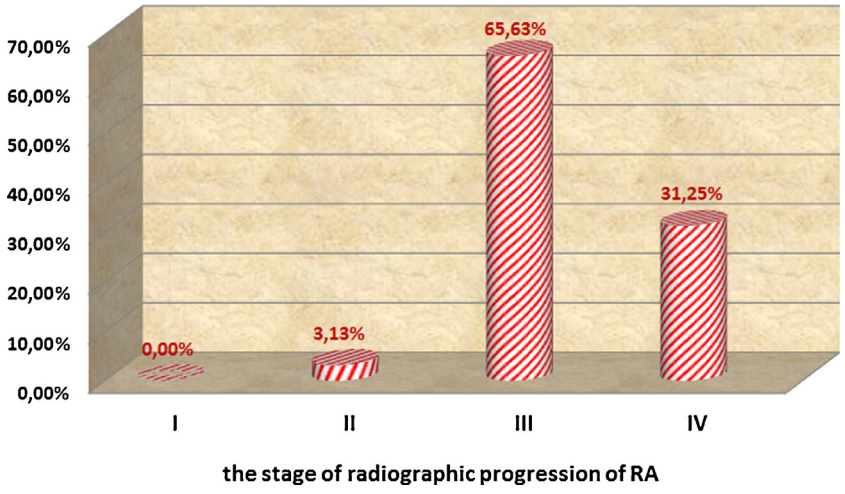

Fig. 2. The presence of voice quality disorders depending on the stage of radiographic progression in RA patients.