

Otorhinolaryngological Manifestations of Rheumatoid Arthritis

ABDEL-HAY EL-ASSY, M.D.; SAMIA KANDIL, M.D.;
ABDEL-LATIF EL-RASHIDY, M.D.;
ASHRAF RAGAB, M.D.; EL-HOSYNI SHERIF, M.D.
and ADEL SARWAT, M.D.

*The E.N.T. and Clinical Pathology Departments, Faculties of Medicine,
Cairo and Menoufia Universities.*

Abstract

Thirty patients with Rheumatoid arthritis were studied for effects of the disease on hearing, laryngeal function, temporomandibular joints and nose. Investigations included audiometry, tympanometry, direct laryngoscopy in selected cases and plain X-ray of the TMJ. Analysis of the results showed seven cases with mild sensorineural hearing loss, 2 cases with mild conductive hearing loss, 4 cases with type As tympanogram, 8 cases with cricoarytenoid joints affection and 15 cases with TMJ affection.

Introduction

RHEUMATOID arthritis (RA) is a connective tissue disease characterized by inflammation within the diarthrodial joints. It affects 2-3% of the adult population. It is the most common autoimmune disease, females are affected three times as frequent as males. It is a systemic disease which is reported to affect the larynx, the ear and the nose. The temporomandibular joints may be involved and it may cause otologic manifestation. The larynx is affected more commonly than the ear or the nose and its incidence was 26-53% of RA patients [1].

The incudomalleal and incudostapedial joints are synovial joints, consequently they could be subjected to involvement

similar to other joints elsewhere in the body [2].

The cricoarytenoid joint is a diarthrodial joint. The affection of these joints has been documented clinically and pathologically [3].

The temporomandibular joints are also affected. Occasionally, they are the first joints to be affected [4].

The aim of this work is to study the otorhinolaryngological manifestations of rheumatoid arthritis, to detect the type and the degree of hearing impairment, to study the incidence and the degree of involvement of the cricoarytenoid joints and the incidence and the degree of involvement of the temporomandibular joints.

Material and Methods

This study included 30 adult patients with RA, diagnosed according to the Revised American Rheumatism Association Criteria. At least 4 criteria from the following 7 should be satisfied [5].

- 1- Morning Stiffness.
- 2- Arthritis of 3 more joint areas.
- 3- Arthritis of hand joints.
- 4- Symmetric arthritis.
- 5- Rheumatoid nodules.
- 6- Rheumatoid factor.
- 7- Radiological changes.

The patients were randomly selected from the outpatient clinic of the Rheumatology and Rehabilitation Department, El Mataria Teaching Hospital irrespective of their medication. They were 27 females and 3 males. Their ages ranged from 30 to 60 years. The duration of the disease ranged from 1-20 years.

Also, a control group of 10 persons was selected to match the age and sex distribution of RA patients. The control group had no symptoms compatible with any arthropathy. They were chosen from the relatives of the persons who accompanied patient to the Rheumatology Clinic.

Both groups were chosen based on:

- Non-smokers.
- No history of neurometric, endocrinal, allergic or respiratory disorders.
- No history of habitual, excessive vocal strain.
- No history of neck trauma, thyroid or anterior neck surgery, chest lesions nor cranial nerve involvement that might be consistent with vocal cord paralysis.
- No history of trauma to the larynx, external or internal from intubation or endoscopy.

- Criteria of intact tympanic membrane without visible scarring and negative history for otorrhea, otologic surgery, acoustic trauma, skull trauma, occupational noise exposure or upper respiratory tract infection with one month from the examination.

The patients and control groups were subjected to the following:

History:

Personal History:

History of present illness which included the following:

- 1- Symptoms of R.A. and treatment received
- 2- Laryngeal symptoms. Foreign body sensation in the throat, fullness in the throat, pain radiating to the ear, hoarseness, dyspnea, stridor, dysphagia, adenophagia, pain with speech and dry mouth.
- 3- Symptoms suggestive of TMJ affection which include preauricular pain, stiffness, vertigo, tinnitus and otalgia.
- 4- Otological symptoms: Especially deafness, tinnitus, vertigo.

Past History: of T.B., diabetes and hypertension.

Examination:

1- General Examination:

With stress on the following: blood pressure, examination of the eye for evidence of conjunctivitis and keratitis (Sjogren's syndrome). Examination of the skin; for skin nodules, skin lesions suggestive of collagen diseases. Examination of the neck for masses, lymph nodes, thyroid enlargement, tenderness on palpation of the larynx and old scars.

2- ENT Examination:

1- Ear examination for evidence of ear disease

2- Nasal examination with stress on the septum to see if there is any perforation.

3- Oropharyngeal examination: for presence of acute infection, dryness or ulceration of the mucous membrane for Sjogren's syndrome.

3- TMJ Examination:

For swelling, tenderness on deep palpation, crepitus and limitation of jaw mobility.

4- Indirect laryngoscopy:**5- Direct Laryngoscopy:**

Which was under general anaesthesia for the following cases:

- Patients who could not tolerate indirect laryngoscopy.
- Patients whose epiglottis covered the view.
- Patients who showed impaired mobility of one or both vocal cords to differentiate cord paralysis from cricoarytenoid fixation. This is tested by a spatula moving the arytenoid.

6- Audiological evaluation:

- 1- Pure tone audiometry.
- 2- Immitancemetry and acoustic reflex threshold.

7- Laboratory:

All cases were subjected to rheumatoid factor estimation as a diagnostic criterion of RA. It was done by Latex agglutination slide test using case sera (Stanbio RA factor, Quick test procedure, No. 11500).

8- Radiologic diagnosis:**A- Plain X-ray film:**

Both hands, antero-posterior, demonstrating wrist, metacarpophalangeal joints and interphalangeal joints for radiological changes of RA.

B- Plain X-ray film of TMJ:

In a dead lateral position of the patient's head and the tube angled 25 degree, each side of the TMJ was examined with closed and open mouth. Assessment of the mobility of the clinoid process within the joint cavity and any radiological changes of RA was recorded.

9- Statistical Assessment:

The following tests were performed:

- Measures of central value: Mean value.
- Measures of dispersion: Standard deviations (SD).
- Tests of significance:
 - * Student's "t" test.
 - * Chi-square test.

Results**I- General Assessment of Rheumatoid Patients:**

- The patients were classified according to the rheumatoid factor into R.F. positive (21 cases) and R.F. negative (9 cases).
- All members of the control group were rheumatoid factor negative.
- 5 patients (16.6%) showed rheumatoid subcutaneous nodules.
- All patients showed positive radiological changes of rheumatoid arthritis in plain X-ray of both hands.

II- Hearing:

1- Group I (Control group):

- Age and sex distribution of the control group:

The mean age 45.3 with a range of 30-60 years. The ratio of females to males was 9:1.

- Audiological findings:

The hearing threshold of the control group was 14.66+ 89 dB with a range from 10-25 dB.

- Tympanometry:

All members of the control group had type A tympanogram indicating normal middle ear function.

- Acoustic Reflex:

The mean acoustic reflex threshold of the control group was 88.25+/-4.73 with a range from 80-100 dB. It indicates normal values.

2- Group II (Patients with RA):

- Age and sex distribution of group II:

The mean age was 45.66+/-7.66 years with a range from 30-60 years. They were 27 females and 3 males with ratio of 9:1 comparison of age and sex between group I and group II showed that there was no significant difference between both groups.

- Audiometric findings:

The mean hearing threshold was 21.46+/-7.30 and the range from 10-40 dB. There was a significant difference in hearing threshold at different frequencies between group I and group II.

The 30 patients of group II were divided according to the presence of hearing impairment above 25dB into two subgroups (Table 1).

Table (1): Hearing Impairment in Group II.

Group II	No.	%
Normal hearing	21	70
Hearing impairment	9	30
Total	30	100

Those patients with hearing impairment were also classified according to the type of hearing impairment into 2 categories: Conductive H.L. (2 cases) and sensorineural H.L. (7 cases).

All had a mild degree of hearing loss, i.e. not exceeding 40 dB hearing loss according to the classification of the American National Standard Institute (ANSI), (1969).

Tympanometric results of Group II:

Table (2): Tympanogram.

Tympanogram	No.	%
A	26	87
As	4	13

According to Jerger classification (1970):

Type A = Compliance more than 0.2cc of equivalent volume.

Type As = Compliance less than 0.2cc of equivalent volume.

There is a correlation between patients with tympanogram As and those patients with conductive hearing loss.

Acoustic reflex:

The mean acoustic reflex threshold at different frequencies was 92.45+/-6.42

with a range of 80-115. It was absent in 4 cases and impaired (threshold above 100dB) in 2 cases.

There is a significant difference between group I and group II at frequencies 500 Hz and 8000, but there is no significant difference at 1000, 2000 Hz.

There is a highly significant difference between the cases with conductive hearing loss and the control group as regards the value of acoustic reflex threshold.

III. Laryngeal Affection:

By indirect and direct laryngoscopy group II (rheumatoid patients) were classified according to cricoarytenoid joint involvement into subgroups (Table 3).

Table (3): Cricoarytenoid Affection in Group II.

Cricoarytenoid affection	No.	%
- ve	22	73
+ ve	8	27
Total	30	100

The 8 patients with cricoarytenoid joint involvement had an age range of 38-55 with a mean age of 45.5 years. They had a duration of disease of 1-20 years with a mean 10.0 years. The 22 patients who were free of CA affection had an age range of 30-60 years with a mean of 45.2 years and duration of disease of 1-20 years with a mean 7.5 years.

Statistically, the correlation between the age of the patients or duration of the disease with CA joint involvement were insignificant.

Examination by indirect and direct laryngoscopy for the patients with cricoarytenoid joint affection revealed the findings in Table 4.

Table (4): Indirect and Direct Laryngoscopy for the Patients with Cricoarytenoid Joint Affection

Laryngoscopy findings	No.	%
Erythema, roughness, oedema on arytenoid	4	14
Limited mobility of the vocal cords	3	10
Complete adduction of both vocal cords	1	3

Erythema and oedema on the arytenoid was unilateral in 2 cases and bilateral in 2 cases, while limited mobility of vocal cords was unilateral in the 3 cases. Complete adduction of both vocal cords occurred in one case and it was due to cricoarytenoid fixation. Only one case showed the manifestations of Sjogren's syndrome.

No evidence of laryngeal rheumatoid nodules nor laryngeal amyloidosis was detected.

Correlation between the cricoarytenoid (CA) joint affection and the presence of positive rheumatoid factor revealed that there was a statistical significance between them.

There was positive correlation between CA involvement and the presence of subcutaneous rheumatoid nodules.

Rheumatoid patients are classified according to the presence of symptoms suggestive of laryngeal involvement into two groups (Table 7).

From those 10 symptomatizing patients, 6 patients showed evidence of cricoarytenoid affection by IL, while the remaining 4 patients were free by IL.

The 10 symptomatized patients were classified according to the number and the frequency of symptoms into the following:

One symptom	2
Two symptoms	3
> 2 symptoms	5
Total	10

IV. The Temporomandibular Joint (TMJ):

Clinical assessment of TMJ in our RA patients revealed that 15 out of the 30 patients had clinical evidence of TMJ involvement.

11 patients from the affect 15 patients had bilateral affection while the remaining 4 patients had unilateral affection.

The most common symptoms were preauricular pain and painful mastication.

Decreased ability to open the mouth maximally occurred in 2 patients.

Radiographic examination of the TMJ revealed that 10 patients (33%) were affected in the following manner:

Radiological findings	No. of patients	%
Anterior displacement of mandibular condyle	2	6
Rarification and irregularity of the condylar articular edge	3	10
Shallow irregular socket	5	17
Total	10	33

V. Nasal Manifestations:

The nose showed no abnormalities except for dryness present in the case of Sjogren's syndrome.

Table (5): Correlations between Cricarytenoid Affection and Rheumatoid Factor.

	CA (+ve)	CA (-ve)	Total	Statistical significance	
RF positive	7	14	21	X^2	p
RF negative	1	8	9	6.66	0.008
Total	8	22	30		

Table (6): Correlation between CA Joint Affection and Rheumatoid Subcutaneous Nodules.

	CA (+ve)	CA (-ve)	Total	Statistical significance	
Rheumatoid nodule +ve	2	3	5	X^2	p
Rheumatoid nodule -ve	6	19	25	6.03	0.004
Total	8	22	30		

Table (7): Laryngeal Involvement.

Laryngeal symptoms	No.	%
Symptomatizing patients	10	33
Non symptomatizing patients	20	67
Total	30	100

Table (8): Correlation between Symptomatized Patients and CA Joint Involvement Using Chi-Square Test.

	CA (+ve)	CA (-ve)	Total	Statistical significance	
Symptomatized patients	6	4	10	χ^2	p
Non symptomatized patients	2	18	20	6.16	0.013
Total	8	22	30		

There is a highly significant correlation between the presence of symptoms suggestive of laryngeal affection and cricoarytenoid joint involvement.

Table (9): Frequency of Symptoms Suggestive of CA Affection.

Symptoms	No. of patients
Foreign body sensation	7
Hoarseness	6
Dysphagia	5
Pain over the larynx	2
Sore throat	2
Pain radiating to the ear	1
Stridor	1

Discussion

Otorhinolaryngological manifestations were evaluated in 30 patients suffering from R.A. Their age ranged from 30 to 60 years with a mean of 45.66 ± 7.66 years and duration of the disease ranged from 1-20 years with a mean of 8.13 ± 6.82 years. 27 patients were females and only 3 were males.

Our study included 10 control persons with age and sex which showed no significant difference with the group, i.e. probably matched.

Determination of the hearing threshold level of the study group revealed that the pure tone average at different frequencies was higher than that of the control group but still within the normal range. The elevated thresholds were due to the 9 cases with hearing loss.

Among these, 9 cases (30%) with hearing impairment, 7 cases (23%) had sensorineural hearing loss and 2 cases (7%) had conductive hearing loss.

Cases with sensorineural hearing loss were of a mild degree and this was compatible with the results of Elwany et al. [7] who found mild sensorineural hearing loss in 29.4%.

This study was not compatible with Reiter et al. [2] who found a higher incidence of sensorineural hearing loss in 48% compared to 15% of the control group. They explained this high incidence by salicylate ototoxicity, vasculitis or neuritis that could theoretically affect the cochlea or cochlear nerve. Veldman et al. [6] stated that it is a part of autoimmune inner ear disease secondary to systemic immune diseases.

Out of the 9 RA cases with hearing loss, only 2 cases (7%) had conductive hearing loss of a mild degree with air bone gap not more than 20 dB.

Reiter et al. [2] reported a 13% incidence of conductive hearing loss in RA patients and the work of Elwany et al. [7] reported an incidence of 1.4% conductive hearing loss.

Copeman [8] suggested that hearing loss in these cases might be due to active rheumatoid process involving the synovial cavities of the small interossicular joints.

As regards tympanometry, we found that 26 patients (86.7%) had type A tympanogram and 4 patients (13.3%) had type As tympanogram which indicated increased tympano-ossicular chain stiffness. We found that one case of the type As tympanogram showed conductive hearing loss bilaterally and the other 3 cases showed normal audiogram.

Elwany et al. [7] found type As tympanogram in 56% of his cases. Goodwill et al [9] stated that there is considerable increase in the frictional resistance of middle ear joints before any hearing loss could be detected..

As regards the acoustic reflex threshold average in our patients, we found a mean

of 92.45 ± 6.42 dB at different frequencies while in the control group a mean of 88.25 ± 4.73 dB. The difference between the disease and the control group was statistically significant.

When the acoustic reflex was elicited contralaterally, it was normal in 24 patients (80%), absent in 4 patients (13%) and impaired in 2 patients (7%). The difference between acoustic reflex of the diseased and the control group was statistically significant and highly significant difference between the control group and patients with conductive hearing loss.

There was a positive correlation (association) between the duration of the disease and the hearing threshold level which means that increased duration of the disease was associated with increase in pure tone threshold level. This may be caused by 2 factors: Neuropathy of the auditory nerve in long standing cases and affection of the interossicular chain joints [7].

In our study, the incidence of CA joint involvement was found to be 8 patients (27%), while 22 patients (73%) did not have any cricoarytenoid involvement. This is compatible with Lofgren and Montgomery [10] who found an incidence of 26% cricoarytenoid involvement, while Rienstock in 1963 [11] found an incidence of 17% of his patients. In 1973, Harris et al. [12] found 40% cricoarytenoid involvement in 88 randomly selected cases of RA. Lawry et al. [13] evaluated laryngeal involvement in 45 patients with RA and found that 32% had abnormalities by indirect laryngoscopy and 54% had abnormalities by computerised tomography (CT).

No statistical correlation could be found between cricoarytenoid joint involvement and the age of the patient or duration of the disease.

As regards symptomatology, careful history revealed that 10 patients (33.3%) had symptoms of cricoarytenoid involvement; only 6 of them (20%) had a possible cricoarytenoid affection by indirect laryngoscopy, while the remaining 4 patients (13.3%) were free.

On the other hand, from the 8 patients (26.7%) who were CA positive by IL only, 6 (10%) patients were symptomatic and the remaining 2 (6.65%) were asymptomatic.

Grossman et al. [14] found that 35% of their patients had symptoms referable to the larynx during clinical course, while Bienenstock et al. [11] found that 16.5% of his patients had symptoms characteristic of CA joint involvement. Also, Lofgren and Montgomery [16] found that 26 of their patients were symptomatizing. On the other hand Harris et al. [12] found a relatively high incidence, where 43% of their patients had symptoms suggestive of cricoarytenoid involvement.

As regards the different symptoms in our 10 symptomatizing patients, there was foreign body sensation in (7/10), hoarseness (6/10), dysphagia (5/10), pain over the larynx (2/10), sore throat (2/10), pain radiating to the ear (1/10) and Stridor (1/10).

Our results were similar to those of Lofgren and Montgomery [10].

We found that some patients had one symptom (20%) others had two symptoms (30%) and the remaining had more than 2 symptoms (50% of the cases).

Charlin et al. [15] reported that the symptoms were an inconstant variable and rarely prominent. Also, they stated that the absence of symptoms does not exclude cricoarytenoid joint involvement.

In our study, only one patient presented

with stridor which was precipitated by upper respiratory tract infection and tracheostomy was done for this patient.

Laryngeal stridor due to CA arthritistis has been observed in connection with a general exacerbation of RA or precipitated by respiratory infection [16], but it can also occur when the general disease is quiescent or only mildly active.

In the present study, 8 patients (27%) had cricoarytenoid joint involvement. Erythema, roughness or oedema of the arytenoid were present in 4 patients (13.5%) which was bilateral in 2 patients and unilateral in the other 2 patients. Limited mobility of one vocal cord was seen in 3 patients (10%), complete adduction of both cords was seen in only 1 patient.

In the present study, one case only had associated Sjogren's syndrome.

No case had rheumatoid nodules in the larynx. Raven et al. [17] described a lesion of the right false cord and arytenoid which had pathological features of rheumatoid nodules.

Mikkleson et al. [19] reported rheumatoid nodules of the vocal cord.

We found that 15 patients (50%) had symptoms suggestive of RMJ affection. This is compatible with Harris [5] who stated that careful history revealed that (55%) of the patients had jaw symptoms at sometime during the course of their disease.

On X-ray examination, we found that 10 patients had radiological abnormalities. This was not compatible with Harris [5] who stated that radiographic examinations revealed structural alterations in 78% of the joints examined. Raustia and Pyhtinen [4] found that the incidence of radiological abnormalities of the TMJ in patients with

RA varied from 5-86% depending on the types of imaging used, selection of patients and criteria employed for classifying changes.

In our study, the nose showed no abnormalities except for dryness present in the case of Sjogren's syndrome. Wilkens et al. [20] reported 4 cases of spontaneous nasal septal perforation in RA, they found no clinical or laboratory features to explain the presence of this perforation.

Mathews et al. [21] reported 7 patients with nasal septal perforation and severe RA with no history to explain the occurrence of perforation. Vasculitis is the feature of RA which has a destructive potential and must be considered as a possible cause.

Conclusion:

10 patients (33%) had symptoms suggestive of cricoarytenoid joint affection. By indirect and direct laryngoscopy, 8 patients (27%) had cricoarytenoid joint involvement. One case showed evidence of sjogren's syndrome. No case showed evidence of laryngeal nodules nor amyloidosis.

15 patients (50%) showed clinical evidence of TMJ affection, 10 patients (33%) showed radiological affection of TMJ.

No cases showed evidence of nasal affection.

References

- 1- DAVID, S.B.: Rheum. arthritis: Otorhinolaryngological manifestations. Clin. Otolaryngol., 13:239, 1988.
- 2- REITER, D.; KONKLE, D. & MYERS, A.: Middle ear immittance in rheum. arthritis. Arch. otolaryngol., 106:116, 1980.
- 3- HELFGOTT, S.M. and TRESELER, P.A.: Cricoarytenoid arthritis in ankylosing spondylitis. Arthritis rheum., 33(4): p. 604, 1990.
- 4- RAUSTIA, A.M. and PYNTHINEN, J.: Computed tomography of the masticatory system in rheum. arthritis. J. Rheumatol., 18(8):1143, 1991.
- 5- HARRIS, E.D. JR.: The clinical features of rheum. arthritis. In: Kelly, W.N., Harris E.D., JR., Rudd, S. and Sledge, C.B. (eds): Textbook of Rheumatology, 3rd ed. W.B. Saunders, Company, Chapter 55, p. 943, 1989.
- 6- VELDMAN, J.E.; ROORD, J.J. and HUGES, G.B.: Immune mediated inner ear disorders. Immunological investigations in the neurology clinic in Itouse, JW, O'Connor, A Feds handbook of Neurological diagnosis. New York, Marceldekker, inc. p. 339, 1986.
- 7- ELWANY, S.; ELGARE, F.A. & KAMEL, T.: Hearing and middle ear function in rheum. arthritis. J. Rheumatol., 13:878, 1986.
- 8- COPEMAN, W.S.C.: Rheumatoid otoarthrit. Br. Med. J., 2:1526., 1963.
- 9- GOODWILL, C.J.; LORD, I.J. and KNILL-JONES, R.P.: Hearing in rheumatoid arthritis. Ann. Rheum. Dis., 31:170, 1972.
- 10- LOFGREN, R.H. and MONTGOMERY, W.W.: Incidence of laryngeal involvement in rheum. arthritis. New Eng. J. Med., 267:193, 1962.
- 11- BIENENSTOCK, H.; ERLICH, G.E. and FREYBERG, R.H.: Rheum. arthritis of the cricoarytenoid joint a clinicopathological study. Arthritis and Rheum., 6:48, 1963.
- 12- HARRIS, E.R.; GROSSMAN, A. & MARTIN, J.R.: Cricoarytenoid involvement in R.A. detection and manifestations. Arthritis Rheum., 16:553, 1973.

- 13- LAWRY, G.V.; FINERMAN, M.L.; HAN-AFEE, W.N.; MANCUSO, A.A.; FAN, P.T. and BLUESTONE, R.: Laryngeal involvement in rheumatoid arthritis. *Arthritis and Rheum.*, 27:873, 1984.
- 14- GROSSMAN, A.; MARTIN, J.R. & ROOT, H.S.: Rheum. arthritis of the cricoarytenoid joint. *Laryngoscope*, 11:530, 1961.
- 15- CHARLIN, B.B.; BRAZEAU LAMONT-AGEN, E.L.; LEVESQUE, R.Y. and LUSSIER, A.: Cricoarytenoiditis in rheum. arthritis: comparison of fibrolaryngoscopic and high resolution computerized tomographic findings. *J. Otolaryngol.*, 14:381, 1985.
- 16- ULRIK, P.; ANNE, G.G.; DENMARK, A. and NORGARD, A.: Rheum. arthritis of the cricoarytenoid joint, a case of laryngeal obstruction due to acute and chronic joint changes. *Laryngoscop*, 90:846, 1985.
- 17- RAVEN, R.W.; WEBER, F.P. & PRICE, L.W.: The necrobiotic nodules of rheum. arthritis. *Ann. Rheum. Dis.* 7:63, 1948.
- 18- WOLDORF, N.M.; PASTORE, P.N. and TERZ, J.: Rheumatoid arthritis of the cricoarytenoid joint. *Arch. Otolaryngol.*, 93:623, 1971.
- 19- MIKKLESON, W.; DUFF, I. and ROBIMSON, W.: Unusual manifestations of rheum. nodules. *Mich. State Soc. J.*, 54:292, 1955.
- 20- WILLKENS, R.F.; ROTHE, G.J.; NOVAKA and WALKE, J.W.: Perforation of nasal septum in rheumatoid disease. *Arthritis Rheum.*, 19(1):119, 1976.
- 21- MATHEWS, J.L.; WORD, J.R.; SAMUELSON, C.O. & KMIBBE, W.P.: Spontaneous nasal septal perforation in patients with rheum. arthritis. *Clin. Rheum.*, 2(1),13, 1983.

