Follow-up study of the treatment of patients for tracheal tumours

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Abstract

Aim: The aim of the study was to evaluate the effectiveness of tracheal tumour treatment based on the analysis of survival, therapeutic management and effect of palliative procedure on improvement in general condition of the patients and their spirometric parameters.

Material and methods: Between 1989 and 2004, 124 patients were treated for tracheal tumours and/or tracheal bifurcation. Thirty-four patients underwent radical operative treatment, and 90 were referred for palliative type. After eliminating 8 (6.5%) who died within 30 days of hospital stay, the study included 116 patients discharged from our Department, 77 (66.7%) men and 39 (33.6%) women aged 17-78, mean 56.4 years.

Results: After operative treatment for tracheal tumours, 5-year survival was observed in 49.7%, but after palliative treatment only 6.8% (P<0.001). Medians were 27.5 and 3.5 months respectively. Among 26 patients who underwent radical resection, 57% survived 5 years. Median was 79 months. After segmentary tracheal resection 76% of the patients survived 5 years, but when such resection was accompanied by resection of tracheal bifurcation, only 22.5% survived 5 years (P=0.003). Medians were 100 months and 11.5 months respectively. A statistically significant improvement in general condition of patients was observed after operative treatment as compared to their pre-operative condition (P=0.018), as well as in the palliative group before and after treatment (p=0.039). No statistically significant differences were observed in spirometric examinations before and after operation either in lung vital capacity (VC) (P=0.075) or forced first-second expiratory volume (FEV1) (p=0.348). On the other hand, in the palliative group these differences were statistically significant both for VC (P<0.001) and FEV1 (P<0.001).

Conclusions: 1. Radical operative resection followed by restoration of tracheo-bronchial tree continuity is an effective method for treating tracheal tumours or bifurcation, and provides the best late results. 2. Mechanical restoration of patency in the bronchial tree followed by stent insertion and radiotherapy and/or chemotherapy is the management of choice in patients with inoperative tracheal tumours. 3. Palliative treatment in patients with inoperative tracheal tumours or tracheal bifurcation enables a substantial improvement to be achieved in patients' quality of life.

Key words: tracheal tumours, treatment, follow-up study.

Background

The essential aim of treating patients affected with tracheal tumours is to achieve a permanent improvement in tracheal air flow [1]. However, it should be noted that the best late results are observed after a radical operation, although the role of particular methods of treatment, alone or in combination, is not definitely clear, and their efficiency depends largely on the tumour type and grade. Interdisciplinary cooperation between a thoracosurgeon and oncologist is important in order to enable all possible therapies and make the patients understand that it is necessary to apply individual planning or treatment procedure [2-4].

Aim

The aim of the study was to evaluate the effectiveness of tracheal tumour treatment based on the analysis of survival, therapeutic management and effect of palliative procedure on improvement in general condition of the patients and their spirometric parameters.

Material and methods

Between 1989 and 2004, 124 patients were treated at our Department for tracheal tumours and/or tracheal bifurcation. These cases made up 2.3% of the population treated for various types of respiratory system tumours.

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All data connected with classifying the patients for tracheal tumour treatment, evaluating the tumour grade or course of the treatment were obtained from archival documentation. It was found that diagnostic management consisted in all patients of routine x-ray photographs of the chest (p-a and lateral projections), computer tomography of the chest and neck, bronchofibroscopy (or rigid bronchoscopy) and abdominal ultrasonography.

Spirometric examinations were performed prior to the treatment, regardless of the kind of therapy and if permitted by the general condition of the patient. This was possible in 108 (93.1%) out of 116 patients. Spirometric examination was performed again just before discharge. General fitness of each patient was tested according to Zubrod's scale (WHO).

Patients were classified for particular methods of treatment based on the examination results, inoperability criteria (disease process affecting a length of more than 6 cm of the tracheal segment and making one-stage end-to-end anastomosis impossible, disease process affecting adjacent organs and structures in the neck or mediastinum, presence of remote metastases) and bad general condition.

An operation allowing the tumour to be removed within macroscopically healthy limits with resection margins remaining free from tumour cells by microscopic examination was considered a total or radical operation (R0). Otherwise, i.e. if microscopic examination revealed the presence of malignant cells, the resection was considered non-radical (R1).

Thirty-four patients underwent radical operative treatment, and 90 were referred for palliative type. After eliminating 8 (6.5%) who died within 30 days of hospital stay, the study included 116 patients discharged from our Department, 77 (66.7%) men and 39 (33.6%) women aged 17-78, mean 56.4 years, and 74 (63.7%) of them were found to be cigarette smokers.

Information on the patients who were discharged from our Department was based on archival documentation provided by the Thoracosurgical Outpatient Clinic. As a routine the patients were seen at least four times during the first year (every three months) and every half a year or as needed thereafter. Apart from physical examination, the patients underwent basic laboratory tests, routine chest x-rays and abdominal ultrasonography. Additional CT of the chest, neck or head was done in a few cases. In order to confirm the dates of death, if any, the information we had was further verified with the Regional Station, the Department of State Register for Communication and Computer Science, the Ministry of Internal Affairs and Administration in Katowice, and the Centre for Medical Analyses and Statistics, Silesian Public Health Centre in Katowice.

Statistical analyses

Data were collected on a spreadsheet using Microsoft EXCEL XP 2002. Following preliminary verification, the data were transferred to a StatSoft STATISTICA 5.1/98 database for analysis and illustration of the results.

Compatibility of continuous variable distribution with normal Gaussian distribution was verified by Kolmogorov-Smirnov compatibility test. Comparative analysis for continuous variables showing distribution compatible with Gaussian distribution was performed by parametric tests such as Student's t test (two samples) or variance analysis (more than two samples). Non-parametric U Mann-Whitney test or Kruskal-Wallis variance rank analysis was used for samples not showing normal distribution or homogeneous variation.

Friedman's test was used to compare spirometric examinations performed before the operation with those performed on discharge.

Survival rates were analysed by Kaplan-Meier method. F. Cox test was used to compare the curves for two samples, and chi-square test for more than two samples. Cox's multiple regression analysis combined with proportional-hazards model of Cox were applied to define a simultaneous effect of many factors on Kaplan-Meier curves.

Results

Causes of death during immediate postoperative period

Among the 34 patients who underwent resection, 3 (8.8%) died during the immediate postoperative period (up to 30 days), and among those who received palliative treatment such death occurred in 5 (5.6%) cases. Clinical and postmortem examinations showed that causes of death in the group of operated patients were: pulmonary embolism (1x), massive haemorrhage to bronchial tree lumen from the injured right pulmonary artery (1x), or disruption of tracheobronchial connection (1x). In the palliative group death was caused by respiratory-circulatory failure as a result of the progressing malignant process (5x).

Characteristics of 116 patients treated for tracheal tumours

Among 116 patients discharged after treatment for tracheal tumours, 31 (26.7%) underwent segmentary resection and 85 (73.3%) could only receive palliative treatment (Tab. I).

On admission the patients reported various complaints, most often dyspnoea (88.8%), cough (75.0%), body weight loss (56.0%). Haemoptysis, stridor or superior caval vein syndrome were rare (18.1%, 20.7% and 11.2% respectively). Other complaints such as dysphagia or hoarseness occurred very rarely.

In the group of 31 operated patients, resection of tracheal bifurcation together with a lung was performed in 17 and segmentary tracheal resection in 14. Among those who received palliative treatment, tracheo-bronchial tree was most often restored using a stent (70x).

Results of treatment for tracheal tumours

After operative treatment for tracheal tumours, five-year survival was observed in 49.7% but after palliative

Tab. I. Patients' characteristics

Factor	Treatment		all No. (%)
	surgery No. (%)	palliative No. (%)	
no	**31 (26.7%)**	**85 (73.8%)**	**116 (100%)**
sex			
M	10 (32.3%)	29 (34.10%)	39 (33.6%)
F	21 (66.7%)	56 (65.9%)	77 (66.4%)
age ± SD (min – max)	52.1±11.3 (17 – 75)	56.0±12.0 (20 – 78)	56.4±12.0 (17 – 78)
complaints (months)			
<3	16 (51.6%)	33 (38.8%)	49 (42.2%)
3-6	10 (32.3%)	25 (29.4%)	35 (30.2%)
>6	5 (16.1%)	27 (31.8%)	32 (27.6%)
localization			
trachea	14 (45.2%)	20 (23.5%)	34 (29.3%)
bifurcation		12 (14.1%)	12 (10.3%)
right tracheo-bronchial angle	15 (48.4%)	5 (5.9%)	20 (17.2%)
left tracheo-bronchial angle	2 (6.4%)	3 (3.5%)	5 (4.3%)
not to consider		45 (53.0%)	45 (38.9%)
histopathology			
SCC	18 (58.0%)	62 (72.9%)	80 (69.0%)
ACC	5 (16.2%)	3 (3.5%)	8 (6.9%)
AC	3 (9.7%)	2 (2.4%)	5 (4.3%)
ASC	1 (3.2%)		1 (0.9%)
other*	4 (12.9%)	18 (21.2%)	22 (19.0%)
condition at admission (acc. Zubrod scale)			
1	23 (74.2%)		23 (19.8%)
2	7 (22.6%)	9 (10.6%)	16 (13.8%)
3	1 (3.2%)	61 (71.8%)	62 (53.5%)
4		15 (17.6%)	15 (12.9%)
tumour size			
<1 cm	4 (12.9%)		4 (3.5%)
1-2 cm	15 (48.4%)		15 (12.9%)
>2 cm	12 (38.7%)		12 (10.3%)
not possible		85 (100%)	85 (73.3%)
nodal status			
N0	16 (51.6%)		16 (13.8%)
N+	15 (48.4%)		15 (12.9%)
adjuvant therapy			
chemotherapy	5 (16.1%)	22 (25.9%)	27 (23.3%)
radiotherapy	5 (16.1%)	19 (22.4%)	24 (20.7%)
radio-chemotherapy	1 (3.2%)	11 (12.9%)	12 (10.3%)
brachytherapy		1 (1.1%)	1 (0.9%)
no therapy	20 (64.5%)	32 (37.6%)	52 (44.8%)
treatment			
partial resection	14 (45.2%)		14 (12.1%)
carinal resection and pneumonectomy	17 (54.8%)		17 (14.7%)
bronchoscopy only		13 (15.3%)	13 (11.2%)
bronchoscopy and stent (T, Y)		70 (82.3%)	70 (60.3%)
tracheotomy		2 (2.4%)	2 (1.7%)

SCC – squamous cell carcinoma; ACC – adenoid cystic carcinoma; AC – adenocarcinoma; ASC – adenosquamous carcinoma.
*(other): leiomyosarcoma 1(0.9%); mucoepidermoid carcinoma 1(0.9%); chondrosarcoma 1(0.9%); atypical carcinoid 1(0.9%); plasmocytoma 1(0.9%); schwannoma 1(0.9%); small cell carcinoma 10(8.6%); squamous papillomata 1(0.9%); carcinoma male diferentiatum non-small cell carcinoma 5(4.3%).

treatment only 6.8% (p<0.001) (Fig. 1). Medians in these two groups were 27.5 and 3.5 months respectively.

Sex and age had no significant relation to the late results of their treatment, either by operation (p=0.229, p=0.712) or palliative procedure (p=0.500, p=0.917).

Among 26 patients who underwent radical resection, 57% survived 5 years. On the other hand, among 5 patients referred for non-radical operative treatment for SCC, 4 died within 2 years (8, 11, 16, 23 months) and 1 is still alive after segmentary tracheal resection for ACC 3 years ago. Median in the first group was 79 months and in the latter (non-radical resection) 14.

After segmentary tracheal resection 76% of the patients survived 5 years, but when such resection was accompanied by resection of tracheal bifurcation, only 22.5% survived 5 years (p=0.003) (Fig. 2). Resection of tracheal bifurcation was always accompanied by resection of right (15) or left (2) lung. Medians in the groups were 100 months and 11.5 months respectively.

If the reason for tracheal resection was squamous cell cancer, 28% of the 18 operated patients survived 5 years. In the group of 11 patients with adenoid cystic carcinoma (5x), adenocarcinoma (3x), atypical carcinoid (1x) adenosquamo-

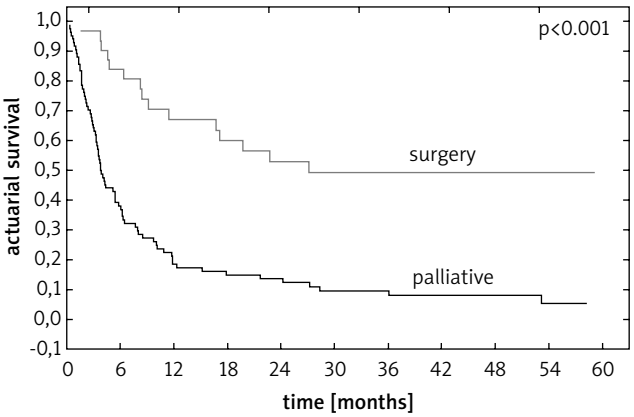

Fig. 1. Follow-up study of the treatment for tracheal malignancies

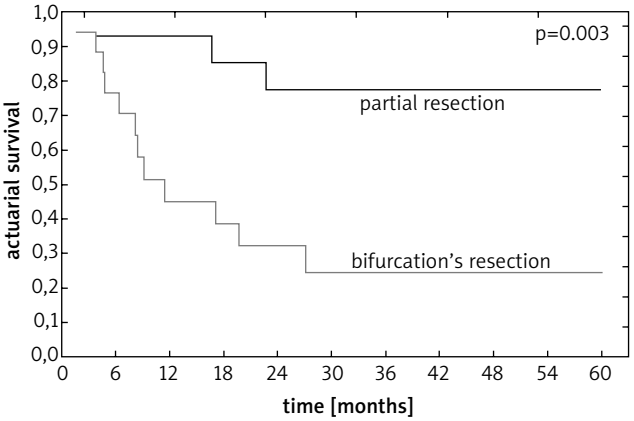

Fig. 2. Follow-up study of the operative treatment of patients for tracheal neoplasms depending on range of resection

us carcinoma (1x) and leiomyosarcoma (1x), 70% survived 5 years. However, the differences in survival rates between the groups were not statistically significant (p=0.213). Survival median in patients with tracheal squamous carcinoma was 17 months as compared to 100 months in patients operated on for other types of tumours.

Size of tracheal tumours had no relation to survival rate either (p=0.748). However, 72.8% of the patients survived 5 years if their tumours were smaller than 1 cm, 47% if their tumours were 1-2 cm and 38.5% if their primary tumours were bigger than 2 cm. Survival medians in these groups were 100, 25 and 20 months respectively.

In the group of 29 patients with segmentary tracheal resection, metastatic regional lymph nodes were found by histopathological examination in 15 (51.7%). Out of them, 13.8% survived 5 years. In the group of 14 patients with no metastases to lymph nodes, 80% survived 5 years (p<0.001) (Fig. 3). Survival medians in both groups were 100 and 9 months respectively.

In the palliative group no statistically significant differences were observed in survival rates regardless of histopathological structure (p=1.000). If squamous cancer was diagnosed, no patient survived 5 years. In other histopathological types, 5-year survival was observed in 12.7% of the patients. Survival medians were 4 and 5 months respectively.

Management by radiotherapy or chemotherapy led to a significant improvement in late results as compared to patency restoration alone (p<0.001). In the group where radiotherapy or chemotherapy was applied, 25.9% of the patients survived 1 year and 19.8% 2 years. Among those who received restoration of tracheo-bronchial tree patency, 6.7% survived 1 year (Fig. 4). Survival medians in these groups were 6 and 3 months respectively.

A statistically significant improvement in general condition of patients was observed after operative treatment as compared to their pre-operative condition (p=0.018). Comparison of general conditions before and after tracheal resection showed that among 31 patients none was able to reach normal life activity without restrictions („0" on Zubrod's scale) prior to the operation, whereas 12 (38.7%) of them were normally active postoperatively. In the palliative group all patients received second, third or fourth degree of fitness (according to Zubrod) on admission. None of them received fourth degree after the restoration procedure but most had first (23.5%) or second (67.0%). Character of the improvement was statistically significant (p=0.039) (Tab. II). It should be stressed that an improvement in general fitness was observed in 45.2% of operated patients and 89.4% after palliative treatment.

In the group of 30 patients no statistically significant differences were observed by spirometric examinations before and after operation either in lung vital capacity (VC) (p=0.075) or forced first-second expiratory volume (FEV1) (p=0.345). On the other hand, in the palliative group these differences were statistically significant both for VC and FEV1.

Multivariate analysis

In order to evaluate as best as possible the prognostic value of all clinical and pathological factors, multivariate analyses of overall survival rates were performed separately, using regression proportional-hazards method of Cox, in the group of operated patients and in the group of patients who received palliative treatment. The results seem to indicate that, when including the effect of all clinical and pathological factors on survival, the independent important prognostic factors are as follows:

a) in the group of patients treated by radical operation (Tab. IIIa)
   - presence of metastases in regional tracheal lymph nodes (p<0.001);
b) in the group of patients treated by palliative method (Tab. IIIb)
   - application of radiotherapy and/or chemotherapy (p=0.002).

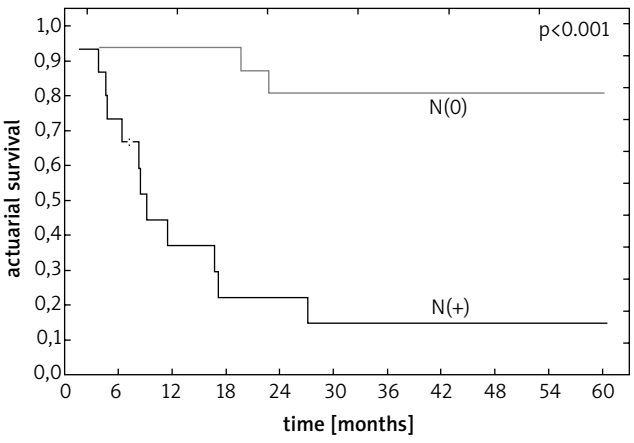

Fig. 3. Follow-up study of the operative treatment of patients for tracheal malignancies depending on regional lymph node metastases

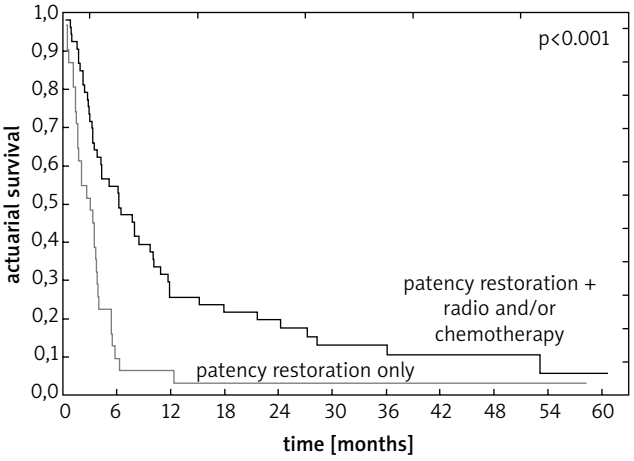

Fig. 4. Follow-up study of the operative treatment of patients for tracheal malignancies depending on therapy

Tab. II. Fitness degree (acc. to Zubrod scale) and spirometric examinations of patients treated for tracheal malignancies depending on treatment

Patients	Fitness degree of patients acc. to Zubrod scale	Patients				p
		before treatment		after treatment		
		No.	%	No.	%	
surgery No. = 31	0	0	0	12	38.7	0.018
	1	23	74.2	12	38.7	
	2	7	22.6	5	16.7	
	3	1	3.2	2	6.7	
	4	0	0	0	0	
palliative No. = 85	0	0	0	0	0	0.039
	1	0	0	20	23.5	
	2	9	10.6	57	67	
	3	61	71.8	8	9.5	
	4	15	17.6	0	0	

patients	spirometric examinations (dcm^3)	time depending on treatment	No. of patients	x ± SD	min – max	P
surgery	VC	before	30	3.65±0.99	1.95 – 5.21	0.075
		after		3.20±0.93	1.7 – 4.4	
	FEV1	before	30	2.19±0.8	0.64 – 3.44	0.348
		after		2.01±0.67	1.2 – 3.15	
palliative	VC	before	78	1.75±0.67	0.70 – 3.31	<0.001
		after		2.31±0.84	1.05 – 4.84	
	FEV1	before	78	1.07±0.40	0.54 – 2.21	<0.001
		after		1.71±0.56	0.82 – 3.39	

VC – vital capacity; FEV1 – forced expiratory volume in one second.

Tab. IIIa. Multivariate analysis for 31 patients treated surgically for tracheal malignancies

Factor	Beta	SD	T value	ß	Wald statistic	p
sex	0.209	0.955	0.219	1.232	0.048	0.826
age	0.039	0.040	0.985	1.040	0.970	0.324
complaint's time	0.256	0.431	0.594	1.292	0.353	0.552
fitness (acc. Zubrod)	0.111	0.561	-0.198	0.894	0.039	0.842
histopathology	0.012	0.743	-0.016	0.988	0.0003	0.987
tumour size	0.015	0.452	0.034	1.015	0.001	0.973
N factor	**1.475**	**0.443**	**3.325**	**4.372**	**11.056**	**0.001**

Tab. IIIb. Multivariate analysis for 85 patients treated palliatively for tracheal malignancies

Factor	Beta	SD	T value	ß	Wald statistic	p
sex	0.219	0.256	-0.854	0.803	0.729	0.393
age	0.001	0.010	-0.080	0.999	0.006	0.937
complaint's time	0.065	0.144	-0.451	0.937	0.203	0.652
fitness (acc. Zubrod)	0.040	0.227	0.174	1.040	0.030	0.862
histopathology	0.107	0.286	-0.375	0.899	0.140	0.708
radio- and/or chemotherapy	**0.777**	**0.251**	**-3.093**	**0.460**	**9.565**	**0.002**

Discussion

Methods and techniques of resecting or mobilizing trachea or tracheal bifurcation are well known and have been described in detail by many authors [3, 1, 2, 5-7]. Tracheal mobilization technique and the way it is performed must pay particular attention to tracheal segmentary structure and vascularization, whereas if lymphadenectomy has been decided, it is essential to have good knowledge of lymphatic vessels [3, 5, 8].

Like other authors, we believe that a surgeon involved in operative treatment of tracheal tumours should seek a compromise between radical and safe resection [9]. Grillo believes that tracheal tumours should only be treated by operation if a one-stage restoration of the organ is possible. Operation should even be considered if the tumour has affected a long segment of trachea and if infiltration into mediastinal structures is suspected [1]. This opinion is in agreement with ours.

Our operative technique (isolated mattress sutures and absorbable PDS (*polydioxanon*) (2/0-3/0) enables easy connection between amputated tracheal walls or between tracheal and bronchial walls (often with different cross-sections), is well tolerated by patients and does not cause problems with healing. Once mattress sutures have been applied, the connection margins will turn out, thus making good mucosa-to-mucosa adherence. This is not only important for tightness but also for prevention of stenosis [5, 8, 6, 7].

Even if granulation tissue does develop it will rather come on the external side of the suture line and will not penetrate inside the tracheal lumen. In our operated population only one (3.2%) patient had tracheal lumen stenosis, and we applied a Y stent on the 35th day after the operation. Similar percentage of tracheal stenosis (3.1%) was observed by Grillo, although Regnard reported 14% for his group [9] (Tab. IV).

Multicentre investigations have indicated that the following four factors play a decisive role in increasing post-operative complications: tracheal length resected, laryngeal mobilization, type of procedure, type of tumour histopathological structure [10, 9].

In order to avoid complications, it seems most important to pay special attention to very correct qualification of patients for surgery (considering tumour location and size of malignant infiltration), and also general condition of patients, age, type of body build and concomitant diseases (steroid treatment, mediastinal irradiation, presence of tracheostomy) [11, 8].

Necrosis and rupture of the anastomosis are related to a high death rate. Early rupture (up to a few days after surgery) can be repaired on condition that tracheal stump margins have not become infected or necrotic [10, 7].

Late complication of the connection healing, usually in the form of suture line stenosis, requires repeated dilations of constricted places, and sometimes another resection accompanied by an end-to-end connection [10]. However, a reoperation and a new connection are not always possible due to the limited length of trachea that can be safely removed. A good solution seems to be insertion of an intratracheal stent [12, 13]. Replacing a length of trachea by a prosthetic appliance, whether made of natural or plastic materials or a combination of both, is still at the experimental stage on account of numerous complications and high mortality rate [14, 15].

A serious problem is connected with the decision on how extensive the tracheal segmentary resection should be, especially if ACC is diagnosed and resection margins are not easy to assess due to its tendency to submucous or perineural infiltration [16]. Anyway, Grillo and Mathisen detected malignant cells in the margins of resected tracheal segments in 29% of their ACC patients and 23% of patients with other tumours despite intraoperative examinations [1].

Our results confirm the need to apply adjuvant radiotherapy whenever malignant cells are discovered in resection margins or metastases in regional lymph nodes [19, 9]. However, it is not possible to present a clear interpretation of the results due to the retrospective character of the study and lack of criteria to qualify for adjuvant therapy, performed in more than one centre and over a long period of time with a small group of patients.

It may be interesting to mention that among the five patients who underwent non-radical operation, three (2xSCC and 1xACC) received adjuvant radiotherapy (54-60 Gy in 28-30 fractions for 5-6 weeks). The first two died after 16 and 23 months respectively, whereas the third has been alive now for 36 months. The other two were in very bad general condition and received no adjuvant therapy. Both died after 8 and 11 months respectively.

Tracheal tumours are still recognized too late despite remarkable progress in diagnostic methods. Therefore many patients present fairly advanced stages of the disease on admission to thoracosurgical departments, and operative

Tab. IV. Morbidity after tracheal resection and bifurcation for tracheal malignancies

Morbidity	No.	Remarks
failure of anastomosis after bifurcation's resection	3	1. resuture (6 postop day) 2. ARDS, pleural empyema, dead 4 months after 3. pleural empyema, dead 3 months after
failure of anastomosis after partial resection	1	stent Y (recovered)
stenosis loco anastomosis	1	stent Y (recovered)
others		
one-side vocal cord paresis	3	conservative treatment
arrhythmia	7	pharmacology
atelectasis	3	bronchoaspiration
sputum	9	bronchoaspiration

ARDS – acute respiratory distress syndrome.

treatment is often impossible [2, 18]. Our observations are quite similar. More than 70% of the patients could not be referred for operative treatment because the malignant process was far too advanced. In such patients the management of choice, often performed as a life-saving action, is restoration of patency in the respiratory tracts. Rigid bronchoscopy helps to remove malignant masses from the tracheal lumen [12]. This type of management was used for 13 (11.3%) patients in our population. Four of them received the treatment several times.

Patency restoration gives patients a chance to be qualified for oncological treatment or, sometimes, for radical surgery. It is also possible to insert a stent. In our population four SCC patients and one ACC patient could receive radical operative treatment following patency restoration procedure. Out of SCC patients, two died after 4.5 and 25 months, whereas two patients with SCC and one with ACC have been alive for 19, 24 and 30 months respectively on the closing date of this study.

Patency in the tracheo-bronchial tree is sometimes restored by means of electrocoagulation or argon plasm [19, 20]. Other methods used for palliative restoration of tracheal or bronchial tree patency include Nd:YAG laser and cryotherapy [21, 19, 22].

Some authors report that laser efficiency in restoring patency is as high as 70%. Absolute contraindications for this type of treatment are tracheo-oesophageal fistulas or malignant stenoses over a length of more than 3 cm [22]. Many surgeons believe that laser therapy should not be used in patients who are planned for resection because a healthy portion of the trachea may easily become damaged to such an extent that restoration of its continuity will not be possible [17].

Palliative intubation of the tracheo-bronchial tree applied upon preliminary restoration of tracheal lumen patency is an effective and safe method of management in this group [4, 12, 13,20]. The effectiveness of the method is confirmed by improvement in spirometric parameters such as lung vital capacity or forced first-second volume observed by many authors [23, 24].

Patients provided with prosthetic appliances due to malignant stenosis in the trachea and main bronchi show an improvement in their general condition, regression or moderation of dyspnoea and such troublesome symptoms as haemoptysis or cough. This type of management helps them to live a relatively normal life too [12, 20, 25]. In our study the restoration of patency followed by palliative intubation of the respiratory tracts led to a significant improvement in both spirometric parameters and quality of life. As shown by Zubrod's scale, 89% of patients improved their fitness after palliative intubation. We observed that the most common complication in „prosthetic" patients was secretion retention in the stent (12.8%). Such patients required repeated aspiration bronchofibroscopy in the first few days following the operation. We had to replace the stent in 15 patients due to progressing malignant disease.

Among our patients in the palliative group, 62% received radiotherapy and/or chemotherapy, both resulting in significantly better late results. Median survival in this group was twice as high as in the group where only patency restoration was applied, and was 6 months. Similar results were observed by other authors [1, 18].

Conclusions

1. Radical operative resection followed by restoration of tracheo-bronchial tree continuity is an effective method for treating tracheal tumours or bifurcation, and provides the best late results.
2. Mechanical restoration of patency in the bronchial tree followed by stent insertion and radiotherapy and/or chemotherapy is the management of choice in patients with inoperative tracheal tumours.
3. Palliative treatment in patients with inoperative tracheal tumours or tracheal bifurcation enables a substantial improvement in patients' quality of life to be achieved.

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