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Value of ct examination in evaluating the response of oesophageal carcinoma to neoadjuvant chemotherapy

Oesophageal cancer is a devastating disease. Five-year survival rates range from 5 to 34% in patients who have respectable tumours, so the prognosis is very poor.(3,8) In the absence of identifiable distant metastatic disease, the depth of tumour and the presence of nodal metastases are the two most important prognostic indicators. Tumour length, circumferential wall involvement and the presence or absence of luminal obstruction are less important prognostic factors (3). In many cases surgery with previous radiation or chemotherapy are used in treatment. The neoadjuvant chemoradiotherapy is administered to patients with oesophageal carcinoma with a belief that this will both downstage the tumour and improve the survival (7). According to Walsh et al., 25% of the patients assigned to multimodal therapy had a complete pathological response after resection and 32 percent were alive for three years, whereas only 6 percent of the patients treated with surgery alone lived for three years (9).

The aim of the study was to assess the value of CT examination in evaluating the response of oesophageal carcinoma to preoperative chemotherapy.

MATERIAL AND METHODS

The CT examination of oesophagus was made in 24 patients in histopatologically recognized oesophageal carcinoma. The group consisted of 18 men and 6 women, aged 35 go 69 years (mean age 56 years). The examination was performed with the CT scanner Somatom ART by Siemens, equipped with matrix of 512x512 pixels. The thickness of slices was 5 mm. The examination was performed before and after iv administration of contrast medium (90 ml of Ultravist). The thickness of infiltrated oesophageal wall, the length of the infiltration, the localization of the lesion and features of invasion of the surrounding structures and enlarged lymph node were analyzed. The statistical analysis of the results was performed. Because the distribution of the thickness of the oesophageal wall after chemotherapy is not normal, the nonparametric tests were used for two paired variables. The Wilcoxon's test was used.

RESULTS

In 5 patients the tumour was localized retro- or paratracheal, in 3 cases it was localized in the bronchial segment, and in 6 patients it was interbronchial. In 10 patients the tumour was

retrocardiac (Fig.1). The length of the tumour ranged from 2 to 17 cm (mean 8.2±0.75 cm). In 2 cases the length of the lesion decreased after chemotherapy, in the first case from 17 down to 11 cm and in the second one from 7 to 4 cm. In 4 cases the infiltration of the aorta was found, and in 1 of them the angle of infiltration decreased after therapy from 78° to 60° (Fig. 2). The infiltration of the trachea, bronchus and atrium were found, each in one case. In 6 patients (25%) the presence of enlarged lymph nodes of tracheal bifurcation was found. In one case the enlarged supraclavicular lymph nodes were found. In 1 patient the atonia of oesophagus after therapy was found. In 3 patient there were no changes in the oesophageal wall thickness after therapy. In other 21 cases (88%) after therapy the reduction of the wall thickness was observed (Fig. 3). Among them significant (reduction of 50% or more in the wall thickness) and medium (reduction of the wall thickness between 25% and 50%) response to chemotherapy was observed in 50 % of patients

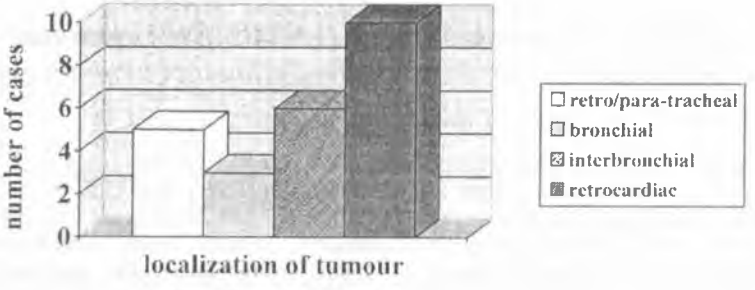

Fig.1. Localization of oesophageal wall infiltration

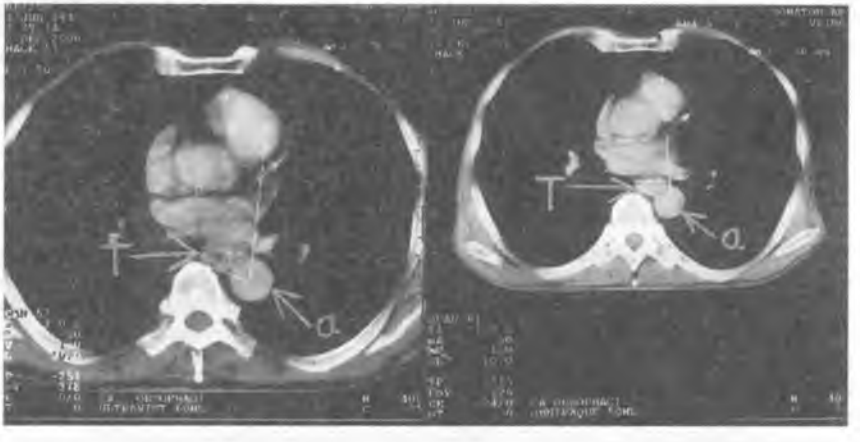

Fig. 2. Oesophageal carcinoma. The tumour infiltrates the aorta. A: the angle of infiltration before chemotherapy was 78°; B: the angle of infiltration after chemotherapy was reduced to 60° (a – aorta, T – mass of tumour)

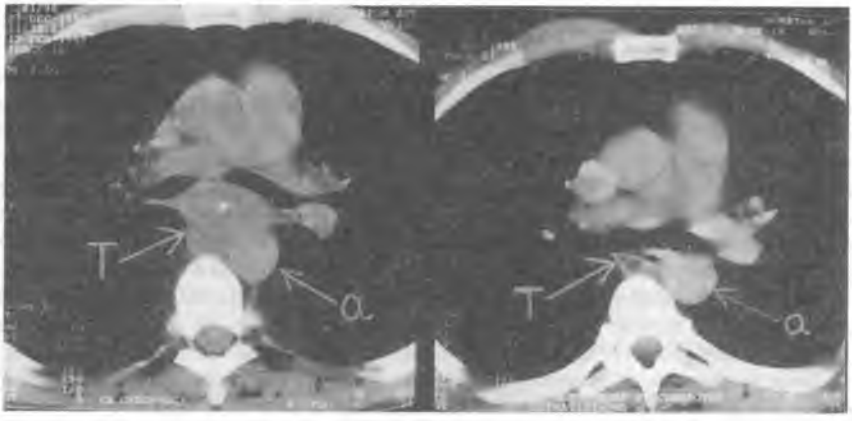

Fig.3 Oesophageal carcinoma. A: the thickness of the oesophageal wall before chemotherapy; B: evident reduction of the wall thickness after therapy (a – aorta, T – mass of tumour)

(Fig. 4). The thickness of infiltrated oesophageal wall before chemotherapy ranged from 12 to 35 mm (mean thickness 22.12 ± 7.45 mm), and after chemotherapy the thickness of the wall ranged from 7 to 18 mm (mean 11 ± 4.84 mm) The statistical analysis showed that the reduction of the oesophageal wall thickness after therapy was statistically significant (p= 0.011).

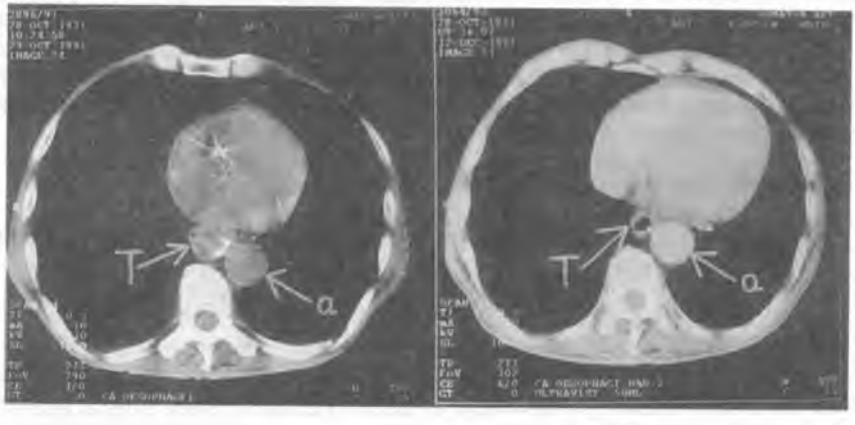

Fig. 4. Oesophageal carcinoma. A: the thickness of the oesophageal wall before chemotherapy; B: almost total reduction of the wall thickness after therapy (a – aorta, T – mass of tumour)

DISCUSSION

Early detection of tumour response to antineoplastic therapy may improve the value of such an approach by allowing continuation of treatment in those likely to benefit while preventing the administration of ineffective and potentially harmful therapy in non-responders (2). Thus the initial

staging of oesophageal carcinoma before chemotherapy is essential, allowing assessment of tumour response to therapy.

Several methods may be used to stage the disease. They include both non-invasive and invasive methods. The former embrace thoracoscopy and laparoscopy. The latter include computed tomography, oesophageal ultrasonography, MRI and positron emission tomography – PET (1, 4, 6). The non-invasive diagnostic method are especially important in evaluating the response of oesophageal carcinoma to chemotherapy, because of their repeatability and because they are well tolerated by the patients.

The oesophageal ultrasonography can quantify the maximum tumour cross-sectional area pre- and post-chemotherapy, but it measures maximum tumour dimensions and not the volume. Other factors that limit endoscopic assessment of chemotherapy response are luminal stenosis, compression of the tumour by the endoscope and an inability to distinguish peritumoral inflammation from tumour (1, 3, 4) Another problem is the fact that oesophageal ultrasonography asseses only the tumour of oesophagus and the nearest lymph node, without evaluating the presence and localization of metastases and enlargement of distal lymph node.

The CT evaluation can overcome some of these difficulties. Even highly stenotic tumours can by fully assessed and CT can asses both tumour dimensions and its volume. Also, the presence of distal lymph node enlargement and metastases can be easily asses. CT can also show loss of fat planes between the oesophagus and the surrounding tissues, as well as displacement of the airway due to tumour growth. The infiltration of surrounding tissues can be assessed and the angle of infiltration of aorta can be measured (3, 4, 5).

Another method of evaluating oesophageal tumours are positron emission tomography. PET is unique in its ability to visualize metabolic activity within the tissue *in vivo*. The increase of glycolytic activity within the tumour tissue allows visualization with proper glucose analogues (2, 6) PET has not been widely used in assessment of oesophageal carcinoma, but it proved to be reliable in the detection of patients with the disease. Approximately in 43% of patients after chemotherapy the reduction of more than 30% in activity was seen. However, in patients with less than 30% reduction in activity it is not clear whether this reduction represents true responses. The resolution of currently available PET system means that small involved lymph nodes are difficult to detect (2). However, PET can assess the response of the oesophageal tumours to chemotherapy much sooner than CT or MR does.

CONCLUSIONS

1. Computer tomography because of its accessibility and relatively low costs is valuable in diagnostics and monitoring the response to preoperative chemotherapy.
2. Unlike oesophageal ultrasonography, CT can fully assess even highly stenotic tumours, enabling assessment of both local and distant lymph nodes.
3. CT enables assessment of the response to chemotherapy based on morphological changes, contrary to PET, which assesses changes in metabolic activity in the tumour.

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SUMMARY

The oesophageal carcinoma is a devastating disease with very poor prognosis. In many cases surgery with previous radiation or chemotherapy are used in treatment. The assessment of the oesophageal tumour response to chemotherapy is very important, because early detection of tumour response to antineoplastic therapy may improve the value of such an approach by allowing continuation of treatment in those likely to benefit while preventing the administration of ineffective and potentially harmful therapy in non-responders. The CT evaluation is a reliable method of monitoring patients during chemotherapy due to oesophageal carcinoma. It can detect reduction of the infiltration thickness, size of enlarged lymph nodes as well as reduction of the angle of aortic infiltration. Unlike in oesophageal ultrasonography, even highly stenotic tumours can be fully assessed in CT.

Wartość badania TK w ocenie raka przełyku po neoadjuwantywnej chemioterapii

Rak przełyku jest ciężką chorobą o złym rokowaniu. W wielu przypadkach stosuje się leczenie chirurgiczne z przedoperacyjną chemioterapią. Ocena odpowiedzi raka przełyku na chemioterapię jest bardzo ważna, ponieważ wczesne wykrycie odpowiedzi na terapię przeciwnowotworową umożliwia kontynuowanie terapii u osób, u których jest ona skuteczna, jednocześnie umożliwia przerwanie terapii u osób niereagujących na leczenie, chroniąc tych pacjentów przed jej niepożądanymi skutkami. Ocena odpowiedzi na chemioterapię w badaniu TK jest wiarygodna, umożliwia wykrycie redukcji grubości nacieku, rozmiaru powiększonych węzłów chłonnych, jak też redukcję kąta naciekania aorty. W odróżnieniu od ultrasonografii endoskopowej nawet nacieki znacznie zwężające przełyk mogą być w pełni ocenione w TK.