An analyse of Binding Memory Alloy Stent with I^{125} seeds

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The ^{125}I seeds have an obvious effect in the treatment of advanced gastrointestinal cancer; therefore, we adopt the method of attaching the ^{125}I seeds in the Nitinol Stent and directly implanting the stent into the tumor under endoscope to solve the problem of dysphagia as well as to achieve the purpose of brachytherapy.

Clinical Data

1.1 General Material

In 12 patients of this group, there were 8 male and 4 female, their courses of the disease ranged from 1 to 6 months. Their main clinical manifestation was dysphagia; and the patients mentioned above were all confirmed by electronic gastroscopy and histopathology. There were 4 cases of adenocarcinoma and 8 cases of epidermoid carcinoma. Dysphagia was classed according to Stooler classification, in which grade 0 meant that petients could take normal food, grade 1 soft food; grade 2 semifluid diet; grade 3. only .fluid diet; grade 4 not even water. There were three cases of grade 4, six cases of grade 3 and one cases of grade 2 in this group. Their lumens can be classified as: two cases of grade 0 (diameter ≤ 2.8mm), four cases of grade É (diameter >2.8mm, but the endoscope can not pass), six cases of grade Ê (the endoscope can barely pass) and 0 cases of grade Ë (the endoscope can pass freely without resistance). The diseased positions were. in lower cardia in 2 cases, in lower esophagus in8 cases and in middle esophagus in 2 cases. The lengths of the tumor ranged from 2 to 10mm.

1.2 Material

The coated nitinol stents, in a size of (18220) mm × (602160) mm, were produced by Micro-Tech (Nanjing).; The Savary Dilator and endoscope were the Type 4400 produced by FUJI, Japan; The $_{125}$ I seeds of Type C IA E27611 were manufactured by China Institute of Atomic Energy. The seeds were Cylinder -shaped and their diameters were 0.5mm. Their half lives were 59.6 days pocessing the energy of X-ray of 27.4 to 31.5MeV and of 35,5MeV. The initial dose rate is about 7.7 cGyöh, and the effective irradiation distance is from 1.7 to 2.0cm. For the half life of 59.6 days, it is a low-energy radiation.

1.3 Method

(1) Calculation of the seed. number: the dose distribution of single seed after implanting dropped inversely by the square of the distance from the source. The surface has the highest dose, and the dose decreased rapidly with the increasing distance, but the decending gradient gradually decreased. We lined up the seeds in parallel lines or triangles. Two seeds was kept in 1 and 2cm. (2) The development of internal radiation stent: we chose the proper covered esophageal stent (manufactured by Micro-Tech (Nanjing)Co., Ltd) according to the lesion length and the degree of the stricture. We firstly fixed the specially made sheaths which.held the seeds outside the stent. Then we put the seed in to the.sheaths according to the lesion length. and lesion characteristics. We loaded the internal radiation stent in the delivery system of esophageal stent. (3) Endoscopic operation: the patients had been fasting for more than 8 hours before operation, they were intramuscularly injected with stabilizing agent and anisodamine 10 mg respectively 30 minutes before operation and undertook the faucial local anaesthesia. The patients of stricture firstly received the dilation by inserting the biopsy forceps into the endoscopic working channel with guide wire followed by savary 2Gilliard dilators of different diameters according to different lesion situations. We dilated the strictures until the endoscope could pass. The lesion length, the distance between the upper lesion and the fore-tooth was determined after the endosope was inserted. We delivered the ^{125}I seeds covered esophageal stent delivery system along with the guide wire until it reached about 2cm under the lower lesion. Then inserted the endoscope again and gradually release the stent which was 4-5cm longer than the lesion length under endoscope, observed the position and releasing status of stent, when necessary, slightly adjusted the stent with biopsy forceps. After releasing, the delivery system was drawn out. Via endoscope, we observed if the seeds were distributing in the lesion as required, if not, immediately adjustment was made, and then flushed the stent wall again and again with the warm water from endoscopic working channel in order to make the stent

expand adequately. After operation, the two ends of the stent should exceed the proximal end and distal end of the stricture about 2cm separately. If the stricture was longer than the stent, two stents could be implanted . The first day after operation, the patient could take warm fluid diet; two days after operation the patient could take semi-fluid diet and then transfer to the normal diet gradually. 1 week after operation, the endoscopy should be carried again to see the stent situation and curative effect.

Resule

2.1 Therapeutic Outcome

All the stents in this group were released successfully at the first time and the stent position was accurate. No I^{125}seeds fell out. Once the stent was implanted, the dysphagia was improved immediately. In this group, 47 ^{125}I seeds were implanted in all, 2 cases were implanted 3 seeds, 9 cases were implanted 4 seeds and 1 case was implanted 5 seeds.

2.2 The Follow-up of Internal Radiation Stent

12 patients were followed-up for 1-6 months . after the operation. The result showed that after implantation, the patients suffered from the retrosternal pains of different degrees. The pain was released about 1 week after the symptomatic treatment. 1 case bled slightly, and this symptom was released after the symptomatic treatment. No haemorrhage and perforation or esophageal fistula happened in all cases. The endoscopy and CT scan 2 months after the operation of this group approved that. the covered stents did not migrate or fall-off, no seeds were missing, and the tumors did not grow into the stents or the ends of the stents. Restenosis was found in one case due to occulusion of food was cleared off after endoscopy. The dysphagia degree of all cases were maintained in grade 0.

Discuss

2 weeks after the operation, this group took the CT scan again and found the esophageal lesions of 11 patients shrank. We carried on the endoscopy again and found the tumors in the position of the stents did not grow and no tumor cells were found after biopsy. The results showed that the active particles suppressed the growth of esophageal tumors. The traditional methods of implanting the stents are usually under the X-ray monitor or .blindly after endoscopically measuring the lesion lengths, which may bring the stents or seeds migration. We adopted the method of implanting internal radiation stents under the direct monitor of endoscope, therefore no cases of stent or seeds migration happened in 12 patients. The success rate was 100%. This method was significantly better than traditional methods. We think that the direct monitor of endoscopy is simpler, which provides accurate positioning, avoids the X-ray injury and can adjust the stent position timely.The stent can be released in the most exact position, otherwise we can adjust it directly. We can also observe the complications like hemorrhage, etc. during operation, which makes the dilation and implantation safer. We used the covered nitinol stents to treat the esophageal strictures under the direct monitor of endoscope and succeeded. The symptoms of esophageal obstruction of patients were alleviated after operation and they could take food. This therapy indeed played a role of relieving the symptoms, easing the pain and improving the patient's life quality. Because the procedure is completed in the endoscopic room, therefore the chance of contacting the X-ray can be reduced for the medical staff and patients. So we believe that this therapy is an effective and safe treatment [1], worthy of clinical application.

References

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