FORUM

Pneumatic dilation versus intraspincteric botulinum toxin injection in the treatment of achalasia cardia in India: an economic analysis

U C GHOSHAL, R AGGARWAL, S KUMAR, S R NAIK

Department of Gastroenterology, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Raebareli Road, Lucknow 226 014

Background: Pneumatic dilation (PD) is an established therapeutic option for achalasia cardia. Recently, intraspincteric botulinum toxin (BT) has been used to treat achalasia cardia in view of its simplicity and safety. However, it is likely to be a costly treatment as repeated injections are often needed due to its short-lasting effect. No economic analysis of PD and BT strategies has been done in India. Methods: A decision tree was constructed using decision analysis software (DATA 4.0; TreeAge Software, Williamstown, MA, USA). Probability estimates for BT injection and PD (and, in case of failure, surgery) were obtained from published literature, preferably from India. Direct "out-of-pocket" costs (in Indian rupees; currently US$ 1 = 49 rupees approximately) for baseline analysis were obtained from our hospital and from some private hospitals. Sensitivity analysis was done using a wide range of probability and cost estimates. Results: Intraspincteric BT injection strategy was more costly at 18,520 rupees per patient than PD strategy (4,568 rupees), yielding an incremental cost of 13,952 rupees per patient successfully treated. Sensitivity analysis supported the conclusions of the baseline analysis. Conclusion: Primary intraspincteric BT injection strategy was costlier than primary PD strategy in the treatment of achalasia cardia in India, and therefore cannot be justified despite its efficacy, relative ease of administration and safety. [Indian J Gastroenterol 2002;21:193-196]

Key words: Cost analysis, decision analysis

Pneumatic dilation (PD) and surgery are established treatment options for achalasia cardia. Following PD, some patients develop complications like esophageal perforation, which may require emergency surgery with its associated morbidity, mortality and expenditure. Thus, there may be a role for simpler and safer treatment modalities. Intraspincteric injection of botulinum toxin A (BT) has recently received attention in the treatment of this condition, because of its relative ease of administration and safety. However, the duration of its action is short and symptoms frequently recur within one year of treatment. Several workers have suggested repeated administration of toxin to overcome high recurrence during follow up.

It is therefore worthwhile to evaluate whether BT treatment is justified as a primary treatment for achalasia cardia on economic grounds, considering the ease of its administration and safety.

Methods

Using a decision analysis software (DATA 4.0; TreeAge Software, Williamstown, MA, USA), we compared two initial treatment strategies for patients with achalasia cardia: (a) PD (with a Rigiflex balloon of 35-mm diameter) and (b) injection of BT (Botox; Allergan, Irvin, CA, USA) 20 units each in four quadrants of the lower esophageal sphincter with a sclerotherapy needle. Details of subsequent outcomes and management strategies are shown in Fig 1.

Clinical probabilities (Table) were obtained by MEDLINE search of published English language literature and a randomized controlled trial conducted by one of the authors. Probability data from Indian studies, where available, were preferred. The time horizon used was only up to one recurrence after successful PD and two recurrences after successful BT.

Assumptions made in this analysis included: (a) all patients with post-PD perforation needed myotomy after closure of perforation on conservative management, (b) myotomy was successful in all cases with failure of treatment with PD or BT, and (c) no complication occurred following elective myotomy despite previous treatment with PD or BT. The latter assumption was made despite some evidence suggesting a higher frequency of complications with surgery following treatment with BT. A typical patient with achalasia cardia included in this analysis was older than 40 years and did not have megaeosphagus or esophageal cancer, in presence of which surgery is the preferred treatment.

Cost data (Table) were obtained from the authors' institution and from several private and government institutions in India. This analysis considered only direct costs in Indian rupees (currently US$ 1 = 49 rupees approximately) in the patients' perspective. In addition to baseline analysis, sensitivity analyses were done on several clinically important variables, particularly those...
strategy compared to the other strategy was also calculated.

Results

BT strategy was costlier at 18,520 rupees per patient than the PD strategy (4,568 rupees), yielding an incremental cost of 13,952 rupees per patient treated. One-way sensitivity analysis with varying cost estimates and clinical probabilities showed that intraspincteric BT injection was costlier throughout the entire range of values used for each parameter (Table). One-way sensitivity analysis, in which frequency of esophageal perforation following PD varied from 2% to 15%, did not change the conclusion of the study analysis (Fig 2). In a two-way sensitivity analysis with varying probability and cost estimates within the range used in this analysis (Table), intraspincteric BT remained a costlier treatment strategy. However, BT was found to be a cheaper option than PD when the cost of the former was equal to or less than 5,000 rupees per session and that of the latter 7,750 rupees or more per session (Fig 3).

Discussion

Our analysis shows that BT is a costlier strategy than PD in the treatment of achalasia cardia in India. Several authors have recommended the use of repeat BT injections in the treatment of achalasia cardia. However, these studies did not take the cost of BT into consideration. This is particularly important in developing countries like India with limited healthcare resources.

Though several studies have evaluated different dosage regimes for BT injection in the treatment of achalasia cardia, only one study on cost-minimization anay-
Ghoshai, Aggarwal, Kumar, Naik

Economics of achalasia treatment in India

Fig 2: One-way sensitivity analysis with probability of occurrence of perforation after pneumatic dilation (PD) and average cost of entire treatment in Indian rupees (INR) per patient plotted. Average cost of entire treatment with botulinum toxin (BT) strategy (♦) is higher than that with PD strategy (△) with even highest frequency of perforation reported till date has been reported till date. This study, from a developed country, showed that BT was preferred on economic grounds in patients with expected survival of less than 2 years. As compared to developed countries, PD is expected to be cheaper in India due to reuse of accessories and lower cost of management of complications including surgical treatment. Therefore, our finding of BT being an expensive therapeutic option was quite unexpected. Failure of sensitivity analysis with wide-ranging probability and cost estimates to alter this conclusion indicates the robustness of our analysis, and the applicability of our results to both ‘for profit’ private hospitals and ‘non-profit’ government institutions in India. Though BT treatment may be preferred over PD when the cost of each session of the former is equal to or less than 5,000 rupees and that of the latter 7,750 rupees or more (Fig 3), such difference in cost is quite unlikely.

Our analysis was somewhat biased in favor of BT as compared to PD. First, we assumed a similar frequency of perforation after PD irrespective of previous treatment. Fibrosis and thinning of esophageal wall following BT may increase the risk of perforation with PD. Second, we considered that elective myotomy was universally successful and had no complication; it has been suggested that myotomy carries a higher risk of complications in patients with previous BT therapy, due to fibrosis and thinning of esophageal wall. Third,

the time horizon used was short; a longer duration of follow up would increase the cost of BT strategy even further, due to need for repeated injections. Fourth, we presumed that all patients with post-PD perforation needed myotomy after closure of perforation with conservative management; since some patients might have effective PD despite having perforation, expenditure of myotomy would be avoided in them. This would result in lower cost of PD strategy than what was found in our analysis.

We found BT to be more expensive than PD even with the highest frequency of perforation reported following PD till date (Fig 2).22 Our conclusion, however, is not applicable to patients with megaesophagus in whom PD is likely to be a poor treatment option.22 The economics of optimum management of these patients need further evaluation.

In conclusion, we have shown that, on economic grounds, BT is not a favored option for the treatment of patients with achalasia cardia in India despite its simplicity and safety as compared with PD.

References


Correspondence to: Dr Ghoshal, Assistant Professor, Fax: (522) 44 0017 or 44 0078. E-mail: ghoshal@pggpi.ac.in

Received March 18, 2002. Received in final revised form May 24, 2002. Accepted June 2, 2002