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## A one-year prospective costing study of botulinum toxin type A treatment of chronic tension headache

Received: 13 May 2004

Accepted in revised form: 15 September 2004

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**Abstract** The objective was to measure the cost of botulinum toxin type A (BTX-A) treatment of chronic tension-type headache. A prospective pharmaceutical costing analysis was completed in the Day Hospital of the Regional Referral Headache Centre at Sant'Andrea Hospital in Rome, chronic tension-type headache patients were treated from February 2003 to January 2004. Patients were treated with 100 U of BTX-A every three months for one year by using the Fixed Doses Fixed Sites procedure. The cost of treatment was based on drug acquisition costs, supplies and professional time needed to administer treatment. The average cost of conventional headache medications was € 853.43 before BTX-A treatment, and € 450.47 after. The cost of BTX-A treatment was € 642.00. Adding the cost of adjunctive conventional medications brought the

total cost of BTX-A treatment to € 1092.47. BTX-A treatment reduced use of conventional headache medications and expenditures although the net cost of treatment increased with BTX-A use.

**Key words** Chronic tension-type headache • Costs • Botulinum toxin type A

### Introduction

A retrospective analysis of the efficacy of botulinum toxin type A (BTX-A) treatment of chronic tension-type headache found that 85% of patients experienced at least some degree of pain relief and reduced their use of anal-

gesics as a result of BTX-A treatment [1]. BTX-A may be a promising alternative to conventional headache treatments. Concurrent to the retrospective analysis, we conducted a prospective costing study in the same patients to identify and measure all pharmaceutical expenditures involved in using BTX-A in the management of chronic tension-type headache.

## Methods

### Objective

The purpose of this analysis was to assess the cost of BTX-A in the treatment of chronic tension-type headache using the principles outlined by Sofio and colleagues [2].

### Design

The study was divided into two parts: part one was a one-year retrospective analysis of headache medication utilisation patterns after BTX-A treatment of chronic tension-type headache as previously described in part one [1]; and part two was a prospective analysis of treatment costs before and after BTX-A treatment. BTX-A was administered at the standard dosage of 100 units [U] every 90 days for a period of one year. The Fixed Doses Fixed Sites (FDfS) procedure has been followed in the administration of BTX-A.

### Participants

A group of 100 chronic tension headache patients were selected among the patients entering the Day Hospital of the Regional Referral Headache Centre at the Sant'Andrea Hospital in Rome in the period February 2003 to January 2004. The patients gave their informed consent to the study, which has previously been approved by the Local Ethics Committee.

### Outcome measures

The primary outcome measure was the cost of one year of headache treatment before and after administration of 4 BTX-A treatments. A secondary outcome measure was the loss of productivity in terms of annual working days lost as reported by appropriate questionnaires submitted to patients.

### Determining the cost of headache treatments

Included in the cost of headache treatment was the cost of BTX-A; the cost of supplies (surgical cotton, gloves, a syringe and alcohol); the professional time needed to administer treatment (determined by clinical experience as 20 min of clinician time and 40 min of nursing time); and the costs of conventional headache treatments instead of, or adjunctive to, BTX-A.

The costs of conventional headache medications were based on drug acquisition costs, the average cost of the first treatment profile (those patients that did not modify their initial therapy) and the incremental cost for subsequent modifications of treatment before and after administration of BTX-A. A direct survey of drug costs based on consumptions by single patients as reported through appropriate questionnaires was used [3].

### Statistical analysis

Intervals of reliability of 90%, 95% and 99% were calculated to express the interval of reliability of the sample-group estimate. The interval of reliability is a key parameter when the sample-group variability – a consequence of the limited number of cases observed – can potentially influence the interpretation of the results.

## Results

BTX-A treatment cost € 141.00 per treatment. At four treatments per year, the cost of one year of BTX-A treatment based on acquisition expenditures was € 564.00. Additional costs, as described in Methods, amounted to € 78 per patient (€ 19.50 4 administrations). Therefore, the total annual cost of BTX-A treatment per patient was € 642.00.

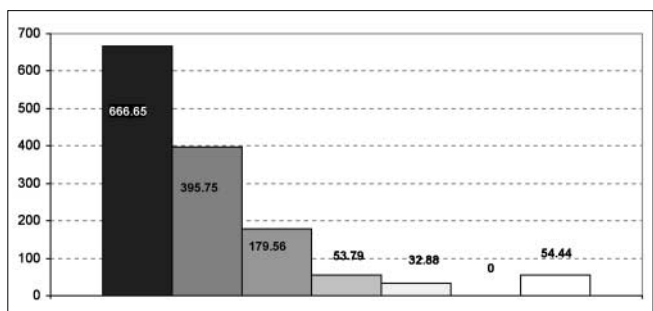
Before the administration of BTX-A, the average cost of conventional headache medications was determined to be € 853.43, with a minimum cost of € 87.70 and a maximum cost of € 3010.85.

Intervals of reliability were determined as follows: at 90% the limit figures were € 737.18 and € 969.67; at 95% the limit figures were € 714.50 and € 992.36; at 99% the limit figures were € 671.97 and € 1034.89.

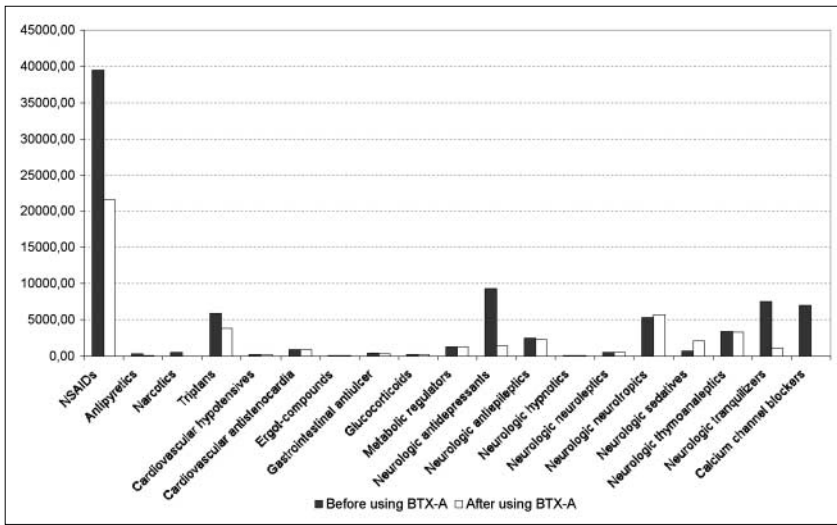
The average cost of conventional headache medications dropped to € 450.47 after administration of BTX-A (min € 45.34 and max € 1354.76).

Intervals of reliability were determined as follows: at 90% the limit figures were € 395.72 and € 505.23; at 95% the limit figures were € 385.03 and € 515.91; at 99% the limit figures were € 365.00 and € 535.94.

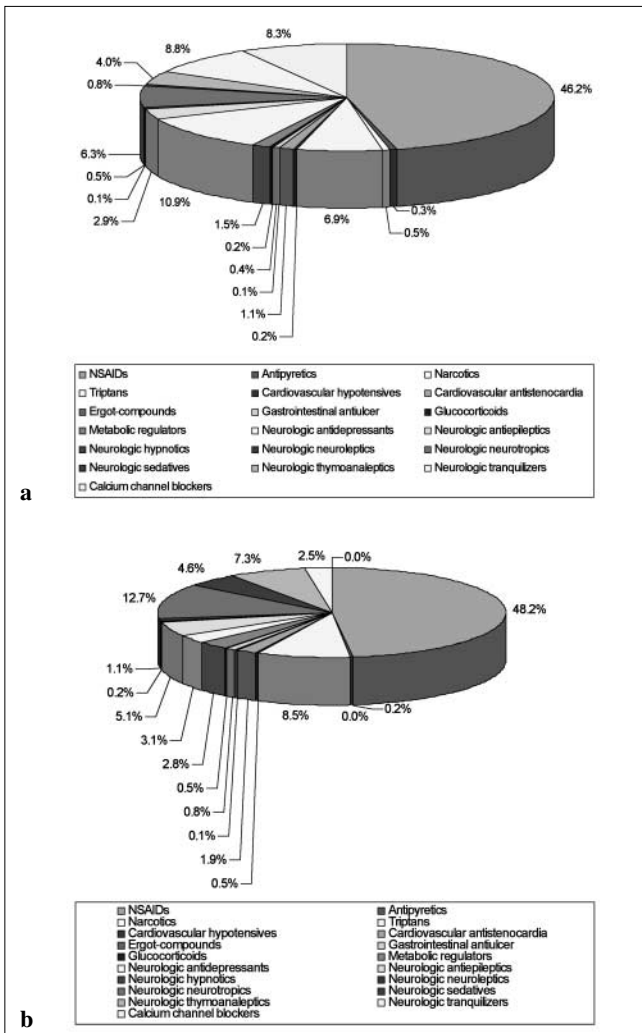
The average cost of the first treatment regimen and the additional cost for subsequent modifications of the treatment regimen (with respect to the initial regimen) were calculated. Only 16 patients followed the initial treatment regimen with no subsequent modifications, at an average cost of € 666.65. A total of 14 patients modified the initial regimen once with an average additional cost of € 395.75; 28 patients modified the initial regimen twice with an aver-



**Fig. 1** Average additional cost per treatment episode (€)



**Fig. 2** Cost (€) for 100 patients for each pharmaceutical category



**Fig. 3a** Percentage of patients using various classes of drugs before using BTX-A treatment. **b** Percentage of patients using various classes of drugs after BTX-A

age additional cost of € 179.56; 32 patients modified three times with an average additional cost of € 53.79; 9 patients modified 4 times with an average additional cost of € 32.88; and 1 patient modified six times with an average additional cost of € 54.44 (Fig. 1).

A more detailed analysis on the basis of single drug classes, as illustrated in Fig. 2 (absolute values) and Fig. 3 (percentage values), allows a direct comparison of costs sustained before and after BTX-A treatment.

An analysis of the percentages of patients using a particular drug class and the total costs per 100 patients was completed.

Before BTX-A treatment, nonsteroidal anti-inflammatory drugs (NSAIDs) were used by 46.2% of patients, with a total cost per 100 patients equal to € 39,445. The results of the analysis of other drug classes are as follows: antidepressants were used by 10.9% of patients with a total cost per 100 patients equal to € 9294; barbiturates by 8.8% costing € 7510; calcium channel blockers by 8.3% at a total cost of € 7050; triptans by 6.9% costing € 5867; and neurologic neuroleptics by 3.0% costing € 5358 per 100 patients.

After administration of BTX-A, the percentage of patients using most classes of drugs decreased. The NSAIDs have seen a reduction of 45%, with a total cost of € 21,695, nevertheless, as a consequence of the strong reduction of other drugs its percentage share is increased to 48.2%. After administration of BTX-A, the percentage of patients using triptans decreased by 35% at a total cost of € 3814, but overall this represented an increase to 8.5% of the remainder of patients using adjunctive medications for headache after BTX-A. Antidepressants and calcium channel blocker usage decreased and barbiturate use ceased completely. The use of other classes of drugs increased in absolute values and in the percentages of patients using them.

**Table 1** Number of working days lost annually

| Working activities         | Male   |        |         |       |         | Female |        |         |       |         |
|----------------------------|--------|--------|---------|-------|---------|--------|--------|---------|-------|---------|
|                            | People | Before |         | After |         | People | Before |         | After |         |
|                            |        | Total  | Average | Total | Average |        | Total  | Average | Total | Average |
| Workers                    | 1      | 10     | 10.0    | 8     | 8.0     | 5      | 59     | 11.8    | 32    | 6.4     |
| Public salaried employees  | 8      | 92     | 11.5    | 67    | 8.4     | 22     | 227    | 10.3    | 141   | 6.4     |
| Private salaried employees | 6      | 57     | 9.5     | 34    | 5.7     | 26     | 243    | 9.3     | 137   | 5.3     |
| Self-employed              | 3      | 14     | 4.7     | 9     | 3.0     | 7      | 38     | 5.4     | 16    | 2.3     |
| Students                   | 1      | 13     | 13.0    | 9     | 9.0     | 3      | 39     | 13.0    | 23    | 7.7     |
| Housewife                  | 0      |        |         |       |         | 18     | 225    | 12.5    | 131   | 7.3     |
| Total                      | 19     | 186    | 9.8     | 127   | 6.7     | 81     | 831    | 10.3    | 480   | 5.9     |

Another important aspect was comparison in terms of loss of productivity calculated through annual working days lost for each working category. Even this analysis was possible only using appropriate questionnaires submitted to patients.

Before BTX-A treatment, the average number of days of work lost per year caused by chronic tension headache were 9.8 days for males and 10.3 days for females. After BTX-A treatment, the average number of lost working days was reduced to 6.7 days per year for males and 5.9 days for females (Table 1).

## Discussion

The results of this economic evaluation revealed a cost of € 853.43 for one year of chronic tension-type headache treatment using conventional medications. After one year of BTX-A treatment, the annual cost of conventional medications fell to € 450.47. The cost of one year of BTX-A treatment was determined to be € 642.00, a figure that includes drug costs, supplies and the time used by medical personnel in administering treatment. The cost of one year of BTX-A treatment of chronic tension-type headache with adjunctive conventional medications was € 1092.47.

BTX-A treatment led to an important reduction of annual lost working days, from an average of 10.1 days to 6.3 days (average of both sexes).

The overuse of various analgesic drugs can lead to the development of a secondary headache disorder, medication overuse headache (MOH), as described in the recently revised 2004 International Headache Society classification [4]. MOH represents an obstacle for the success of any headache treatment regimen and remains a major cause of incremental cost increases for drug expenditures for the treatment of chronic tension headache [3, 5].

BTX-A treatment has been shown to be safe and efficacious in the treatment of a variety of headache types [6–11], and, in several trials, reductions in analgesic use and expenditures have been demonstrated [11, 12]. The results of this trial suggest that BTX-A treatment results in a marked reduction in the use and expenditures associated with conventional headache treatments and may, therefore, impact the incidence of MOH.

Further studies are needed to measure the overall global burden of headache [13] and its socioeconomic impact [14] as it applies to chronic tension headache. There is also a dearth of literature focussed on the impact of chronic tension headache on quality of life and working activities. Most of the headache studies that focused on quality of life or loss of productivity relate to the burden of migraine headache [15–20]. Studies assessing the potential impact of BTX-A treatment on the economic, societal and quality of life burden of chronic tension headache would be of great interest.

**Acknowledgement** This research has been supported by an unrestricted educational grant from Allergan Inc, Irvine, USA.

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