

# Botulinum Toxin Type A for Facial Rejuvenation: Treatment Evolution and Patient Satisfaction

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## Abstract

**Background** Novel applications and injection sites for Botox are continually evolving. This study aimed to analyze Botox outcomes for various injection sites to differentiate treatments that consistently yield impressive results from those that produce less patient satisfaction. The change in the prevalence of Botox usage for each facial subsite over a 2-year period also was evaluated.

**Methods** A retrospective chart review was performed for 60 patients who received Botox injections in a private cosmetic surgery practice. Patients were sampled from 24-month periods 2 years apart. The information collected included dosing and injection intervals and patterns. The outcomes analyzed included the prevalence of injections by subsite and the retention rate.

**Results** The most frequently injected subsite was the glabellar region. The findings showed an impressive trend toward increasing numbers of patients receiving treatment of the superolateral orbicularis oculi (57–80%) and the depressor anguli oris (10–20%).

**Conclusions** Botox injection for facial rejuvenation has an excellent track record for patient satisfaction. The prevalence of treatment for the traditional injection sites was very stable over the measured period. The study findings support the use of Botox in certain more recently

described regions such as the superolateral orbicularis oculi and the depressor anguli oris.

**Keywords** Botox · Botulinum toxin A · Patient satisfaction · Aging face · Depressor anguli oris

Traditionally, the use of botulinum toxin type A (Botox) in facial plastic surgery has yielded high patient satisfaction [1, 2]. However, medical innovation has resulted in constantly evolving new applications and injection-site locations. Unfortunately, the expanding role of Botox has not translated into clear clinical benefit. The current study aimed to analyze Botox outcomes for various injection sites to differentiate treatments that consistently yield impressive results from those that produce less patient satisfaction.

Treatment success can be measured in various ways. Evaluation of results by an external observer and patient satisfaction ratings both are informative. However, these are subjective assessments, and neither directly evaluates the potential for Botox to be requested regularly by patients. Furthermore, the concept of satisfaction is somewhat ambiguous. For example, studies have demonstrated that patient satisfaction ratings fluctuate depending on survey timing [3]. This phenomenon may result from unfamiliarity with procedures, cost, adverse side effects, or unrealistic expectations despite informed pretreatment discussions.

In contrast, the prevalence of injections at each facial subsite can be counted and quantified. This objective measure should indicate which injection sites are most satisfying to patients because, presumably, injection sites correlating with heightened patient satisfaction will be requested more often than those yielding marginal or no benefit.

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Data indicating the distribution of Botox use in specific facial subsites are sparse. Some authors have suggested the following approximate Botox distribution: 90% in the upper face and 10% in the lower face [4]. This study aimed to evaluate the change in the prevalence of Botox usage for each facial subsite over 2 years and to determine those sites rating the highest in patient satisfaction.

## Methods

A retrospective chart review was performed for 60 patients who received botulinum toxin type A (Botox Cosmetic; Allergan Inc., Irvine, CA, USA) injections in a single private cosmetic surgery practice setting. This practice is among the top 30 injection centers in a major metropolitan area (Toronto, Canada), as measured by Botox consumption. All the injections were performed by the senior author (P.A.A.). The charts were randomly chosen within two 4-month periods 2 years apart (1 March 2006 to 1 July 2006 and 1 June 2008 to 1 October 2008). All the subjects were treated at least 10 months before the study date to allow for proper follow-up data.

Data were collected on gender, age, facial regions injected, initial dosing, latest dosing, injection interval, and the number of injections received at the practice under study. The outcome measures included the prevalence of injections according to facial subsite and the “retention rate.” The retention rate was calculated as the percentage of patients returning within 6 months of their last visit. The prevalence of each treated facial area was compared separately between the 2 years using the chi-square test (and Fisher’s exact test where warranted by a small sample size).

## Results

The two groups had no overlap. There were 58 women and two men equally distributed between the two groups, with 29 women and one man in each group. The mean age of the patients was 50 years (range, 25–81 years). The overall distribution of ages did not differ between the two groups ( $p = 0.18$ ). The patient characteristics are shown in Table 1. The retention rates were 70% for 2006 and 76% for 2008. The average number of visits per patient was 6.7 in 2006 and 6.0 in 2008.

The most commonly injected facial subsite was the glabellar region. Table 2 presents the percentage of patients receiving treatment in each facial area, and Fig. 1 shows the number of treated patients for each area. Table 2 also includes the range and average dosages used in each area. The percentage of patients receiving treatment in each facial area did not differ significantly between the 2006 and

**Table 1** Comparison of patient demographics between 2006 and 2008

Patients	2006 n (%)	2008 n (%)
Gender		
Female	29 (97)	29 (97)
Male	1 (3)	1 (3)
Age range		
<35	0 (0)	4 (13)
35–45	12 (40)	7 (23)
>55	12 (40)	13 (43)

2008 cohorts. The findings showed a trend toward an increasing percentage of patients receiving treatment of the superolateral orbicularis oculi (57–80%) and the depressor anguli oris (DAO) (10–20%) over the study period.

The average number of areas and the total dose per patient for the first and last visits are shown in Table 3. The only complication that occurred was mild bruising. The cost of the procedure did not change over the 2-year interval.

## Discussion

Botox treatments have typically been associated with high patient satisfaction ratings [1, 2]. The traditional and dependable injection sites for Botox include the glabellar lines, the horizontal forehead lines, crow’s feet, the bunny lines, and the perioral area [5]. More newly proposed injection sites include the superolateral orbicularis oculi (for the lateral brow-lift), the inferior orbicularis oculi (for malar smile lines), the DAO (to treat the mouth frown), the mentalis (for dimpled chin), the risorius, the levator labii complex (for gummy smile), the masseter, and the platysma (for neck bands) [6].

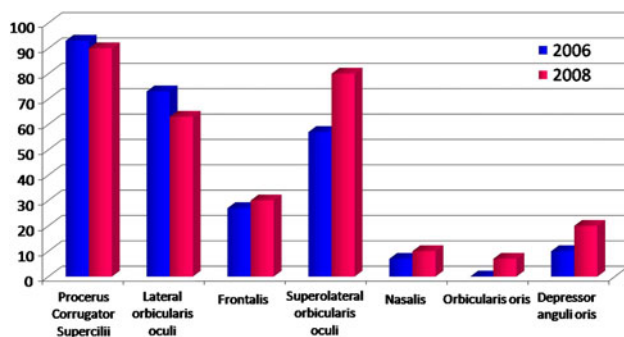
The prevalence of injections in these various areas provides a reasonable proxy for an estimate of their efficacy. Injection sites with a high overall patient satisfaction rating will tend to be requested more, and likely will correlate with improved patient retention rates. Therefore, looking at the change in prevalence over time can indicate which of the newer injection sites have the same high level of dependable patient satisfaction as the more traditional treatment sites.

The percentage of patients receiving treatment in each facial area did not differ significantly between 2006 and 2008. This may be due to an underpowered study. However, the findings showed a significant trend toward an increasing prevalence of treatment for two facial areas: the superolateral orbicularis oculi and the DAO. Table 2 and Fig. 1 show that prevalence of treatment for the

**Table 2** Comparison of the percentages of patients receiving treatment in each facial region

Facial region	Facial muscles	Average dose (units) n (range)	2006 n (%)	2008 n (%)	<i>p</i> Value 2006 vs. 2007
Glabellar lines	Procerus corrugator supercillii	30 (15–42)	28 (93)	27 (90)	0.9
Crow's feet	Lateral orbicularis oculi	16 (10–24)	22 (73)	19 (63)	0.63
Forehead lines	Frontalis	10 (6–12.5)	8 (27)	9 (30)	0.81
Lateral brow	Superolateral orbicularis oculi	8 (6–10)	17 (57)	24 (80)	0.27
Bunny lines	Nasalis	4 (4)	2 (7)	3 (10)	0.65
Lips	orbicularis oris	3 (2–4)	0 (0)	2 (7)	0.9
Mouth frown	Depressor anguli oris	8 (8)	3 (10)	6 (20)	0.32

The range and average dosage used in each area are included

**Fig. 1** Number of patients receiving treatment in each facial area displayed by year: 2006 versus 2008**Table 3** Comparison of the average numbers of areas and the total doses per patient during her first and last visits

Parameter	Visit order	2006	2008
Average number of areas treated per visit	First	2.3	2.3
	Last	2.5	2.9
Average total dose (units) per visit	First	31.4	31.6
	Last	34.5	37.2

superolateral orbicularis oculi injection site increased from 57 to 80%. This relatively high initial prevalence and the subsequent increase suggest that the superolateral orbicularis oculi is an area of concern to many patients and that Botox injection there provides impressive results.

Notably, no injections were administered to the inferior orbicularis oculi, mentalis, risorius, levator labii complex, masseter, or platysma. The reason for this may be results less satisfactory than at other sites, high dosage and cost, or a combination of the two. Alternatively, these areas may generally be of concern to a smaller proportion of the population seeking cosmetic procedures. However, if the cost–benefit ratio is truly comparable with that of the more established injection sites, then the prevalence of treatment should increase for these less popular sites over time. For example, Table 2 and Fig. 1 show that the prevalence of

the DAO injection, although still only 20% in 2008, actually doubled over the measured period. This combination of relatively low but increased prevalence suggests that the DAO injection site is of concern to a small percentage of the population but still has excellent results. Table 2 and Fig. 1 demonstrate that there was not a large change in the prevalence of injections for the procerus/corrugator supercillii, lateral orbicularis oculi, frontalis, nasalis, or orbicularis oris.

For the benefit of novice injectors, Botox dosage by area is included in Table 2. The average dosages should serve only as approximate guidelines, and clinicians must titrate according to patient-specific requirements. A conservative approach is to initiate therapy at the lower end of the given range and then to increase doses at subsequent visits as required.

The injection points were very closely adherent to the standard points documented in consensus guidelines [5]. For the treatment of horizontal forehead lines, some variation exists in location and dose administration dictated by patient parameters, but a general guideline is to avoid injections lower than 3 cm superior to the lateral brow to minimize the risk of lateral brow ptosis.

Furthermore, any practitioner electing to administer Botox treatment for facial rejuvenation should possess thorough knowledge of facial mimetic muscle anatomy. Two elegant anatomic studies of the corrugator supercillii [7] and DAO [8] represent excellent descriptive resources for these often inaccurately represented muscles. Lack of appropriate anatomic understanding can contribute to undesired complications and diminished the efficacy of the therapeutic effect.

Finally, the retention rate can be used to evaluate patient satisfaction with the overall combination of injections. A study by White et al. [9] showed a patient retention rate of 55%, which increased to 67% after measures were instituted to optimize patient retention, such as a standard 2-week post-initial treatment evaluation. The retention rates for the patients in the current study were 70% in 2006

and 76% in 2008. This suggests that the prevalent injection sites in this study were those with optimal outcomes and high patient satisfaction.

The primary limitation of this analysis stems from the inherent biases introduced by a single injector. That is, a lack of knowledge concerning the available treatment areas or a lack of interest in the less conventional injection sites could have steered patients away from these possibilities, thereby skewing the results. However, in this study, the senior author was comfortable with all the possible facial injection sites and did not actively discourage patients from any particular options.

## Conclusion

Botox injection in the setting of facial rejuvenation has an excellent track record for patient satisfaction. However, with burgeoning applications, injectors should exercise caution before readily incorporating some of the more newly described facial injection sites into their repertoire. The results of this study demonstrate that the prevalence of the traditional injection sites was very stable over the measured period, further underscoring their tendency toward high patient satisfaction.

The findings also support the use of Botox in more recently described regions, such as the superolateral orbicularis oculi and the DAO, for which injections became more prevalent over the study period, implying good results. In the future, a multicenter study to increase the power of the current study and to corroborate its findings

would be useful. Moreover, other measures such as observer ratings and patient satisfaction surveys would further elucidate the role for Botox for these new treatment areas.

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