

# Survey among women using Botox, Filler, and plasma injections in Basrah

Noor S. JUMMAAH<sup>1</sup>, Abeer A. AL-MAWALI<sup>1</sup>, Nibras S. AL-AMMAR<sup>2</sup>, Sara Sarmad MANNA<sup>3</sup>

<sup>1</sup>Department of Pathology and Forensic Medicine, College of Medicine, University of Basrah, Basrah, Iraq

<sup>2</sup>Department of Microbiology, College of Medicine, University of Basrah, Basrah, Iraq

<sup>3</sup>Gynecology and Obstetric Department, College of Medicine, University of Basrah, Basrah, Iraq

Noor S. Jummaah **ORCID ID:** 0000-0001-5294-0211

## ABSTRACT

**Objective.** Cosmetic procedures are popular in the world and practiced by both male and female. The origin of Botox is botulinum toxin of *Clostridium botulinum*, two main commercial types of botulinum (A and B) have been used in cosmetic clinics. The present study studied the distribution of the women according to types of cosmetic procedures, age groups, marital status, job status, and their knowledge about these procedures and its side effects.

**Methods.** A total of 100 women were included with age group between ( $\leq 30$  -  $> 30$ ) years. 54 (54%) have obtained cosmetic procedures (Botox, Filler, and plasma injections) while 46 (46%) have not obtained any cosmetic procedure. Platelets rich plasma was done by cosmetic specialized physician in private cosmetic clinic by using (Regen Kit BCT A-PRP). Platelets count was done in private Hematology laboratory by specialized Hematology physician. The device used for platelet count was (System XS 500). Collected data was subjected to statistical analysis by using SPSS version 20.

**Results.** 51.85% women obtained their cosmetic procedures at a doctor clinic, (37.04%) at a Beauty Salon, and (11.11%) at both doctor clinic and Beauty Salon. Women within age group ( $\leq 30$ ), (12%) have Botox only, (20%) have Filler only, (20%) have plasma injections only, (32%) Botox and Filler, (16%) have Botox, Filler, and plasma injections. 24.14% of women within age group ( $> 30$ ), have Botox only, (6.90%) have Filler only, (13.79%) have plasma injections only, (31.03%) Botox and Filler, (6.90%) have Botox and plasma injections, (17.24%) have Botox, Filler, and plasma injections. Platelets count in PRP samples in stage 1 sample from woman no.1 was  $373 \times 10^9/L$ , while in (stage 2) sample was  $724 \times 10^9/L$ . Platelets count in whole blood of woman no.1 was  $(202 \times 10^9/L)$ . Platelets count in stage 1 sample from woman no.2 was  $413 \times 10^9/L$ , while in (stage 2) sample was  $808 \times 10^9/L$ , Platelets count in whole blood of woman no.1 was  $320 \times 10^9/L$ . There was statistically significant increase in platelets count in stage 1 and stage 2 in both samples ( $P$ -value=0.05).

**Conclusions.** Women within age group ( $\leq 30$ ) prefer to do cosmetic treatment even if they do not need that. Many women have awareness and confidence in doing these cosmetic treatments in doctor clinic rather than beauty salon. PRP platelets count indicated that using (Regen Kit BCT A-PRP) was successful in obtaining concentrated PRP from woman's blood sample, comparing with the normal platelets count in whole blood. Results also explained that increasing the speed and period of centrifugation in the method of (Regen Kit BCT A-PRP) might give high concentrate of PRP.

**Keywords:** Botox, Filler, plasma injections, cosmetic procedures

Corresponding author:

Noor S. Jummaah

E-mail: noor.jummaa@uobasrah.edu.iq

Article History:

Received: 21 February 2024

Accepted: 24 June 2024

## INTRODUCTION

Cosmetic procedures are popular in the world and practiced by both male and female. In Middle Eastern region especially areas concerning with religious life-style it is hard to find studies concerning cosmetic procedures, although many people attending cosmetic clinic [1]. These procedures in general aim to enhance the person's physical appearance [2]. Some people accept cosmetics procedures as an option to increase self-esteem [3,4]. The present study aimed to survey the knowledge and practice of three of most commonly used cosmetic procedures (Botox, Fillers, and platelet rich plasma (PRP) injections) among women in Basra. The origin of Botox is botulinum toxin of Clostridium botulinum, two main commercial types of botulinum (A and B) have been used in cosmetic clinics. Administration of Botox in small injections blocks nerve impulses leading to reduce specific muscle activity. It is used for treatment of muscular conditions, chronic migraine [5]. Also it is used in cosmetic clinic to remove wrinkles [6]. Dermal fillers are non-surgical, anti-aging procedure used to plump lips, fill hollow cheeks and reduce the signs of aging [7]. Platelet-rich plasma (PRP) is an autologous concentration of platelets in small volume of plasma; platelets have growth factors which play a role in healing process [8], treatment of hair loss [9], and aging skin [10,11]. Many studies showed that women prefer cosmetic procedures more than men [2]. Cosmetic treatment by Botox might cause many side effects like facial paralysis, double vision, eyelid droop, swelling, redness, and allergic reactions [12]. Platelets-rich plasma used in cosmetic treatment since 1987, no major side effects have been reported [13-16].

The present study studied the distribution of the women according to types of cosmetic procedures, age groups, marital status, job status, and their knowledge about these procedures and its side effects.

## METHOD

Individuals under study were asked to answer questions included. Collected data was subjected to statistical analysis by using SPSS version 20.

### Method of obtaining Platelet-rich plasma

#### Regen Kit BCT A-PRP

This method was done by cosmetic specialized physician in private cosmetic clinic. The Blister packs opened carefully and prepare the tubes for blood collection. Venous puncture using butterfly needle connected to the collection holder, waited until the blood collected in the flexible tube, under the yellow plastic section. The stopper of the Regen BCT and Regen AST tubes were pierced to full with the whole blood using

the internal needle of collection system. The vacuum within the tubes enabled automatic collection of blood (8 ml). The tubes turned upside down several times carefully. Centrifugation was done in two stages, 1st stage 1200g for 7 minutes. The 2nd stage 1600g for 9 minutes. The blood was fractionated: RBCs were trapped under the gel, and cellular elements settled on the surface of the gel (Figure 1). The Regen BCT tubes inverted several times gently, processed to the re-suspension of the cellular deposit in supernatant about 4 ml of PRP obtained for each tube (Figure 2).

#### Method of counting the platelets in PRP

Platelets count in 1 ml of platelet-rich plasma was done in private Hematology laboratory by specialized Hematology physician. The device used for platelet count was System XS 500.



FIGURE 1. Supernatant with PRP (after centrifugation)

## RESULTS

### Distribution of women according to age group and type of cosmetic procedures

Results showed that out of 25 women within age group ( $\leq 30$ ), 3 (12%) have Botox only, 5 (20%) have Filler only, 5 (20%) have plasma injections only, 8 (32%) Botox and Filler, 4 (16%) have Botox, Filler, and plasma injections. Also results showed that out of 29 women within age group ( $> 30$ ), 7 (24.14%) have Botox only, 2 (6.90%) have Filler only, 4 (13.79%) have plasma injections only, 9 (31.03%) Botox and Filler, 2 (6.90%) have Botox and plasma injections, 5 (17.24%) have Botox, Filler, and plasma injections (Table 1).



FIGURE 2. Platelet rich plasma

**Distribution of women obtaining cosmetic procedures according to Job status**

Out of 10 women having Botox only, 6 (60%) have job, 2 (20%) were students, 2 (20%) have no job. Out of 7 having Filler only, 4 (57.14%) have job, 1 (14.29%) was student, 2 (28.57%) have no job. Out of 9 having plasma injections only, 5 (55.56%) have job, 1 (11.11%) was student, 3 (33.33%) have no job. Out of 17 having Botox and Filler, 11 (64.71%) have job, 2 (11.76%) were students, 4 (23.53%) have no job. Out of 2 having Botox and plasma injections, 2(100%) have job. Out of 9 having Botox, Filler, and plasma injections, 8 (88.89%) have job and 1 (11.11%) was student (Table 2).

**Distribution of women obtaining cosmetic procedures according to treatment intervals**

Figure 3 showed that out of 54, 40 (74.07%) were obtaining cosmetic procedures in an interval of ≤6 months and 14 (25.93%) in an intervals of >6 months.

TABLE 1. Distribution of women obtaining cosmetic procedures according to age group

Age group	Botox only	Filler only	Plasma injections only	Botox & Filler	Botox & Plasma injections	Botox, Filler, and Plasma injections	Total N=54
≤30	3 (12%)	5 (20%)	5 (20%)	8 (32%)	0 (0%)	4 (16%)	25 (100%)
>30	7 (24.14%)	2 (6.90%)	4 (13.79%)	9 (31.03%)	2 (6.90%)	5 (17.24%)	29 (100%)

TABLE 2. Distribution of women obtaining cosmetic procedures according to job status

Job status	Botox only N= 10	Filler only N= 7	Plasma injections only N= 9	Botox & Filler N= 17	Botox & Plasma injections N= 2	Botox, Filler, and Plasma injections N=9
Having job N=36	6 60%	4 57.14%	5 55.56%	11 64.71%	2 100%	8 88.89%
Student N=7	2 20%	1 14.29%	1 11.11%	2 11.76%	0 0.0%	1 11.11%
Have no job N=11	2 20%	2 28.57%	3 33.33%	4 23.53%	0 0%	0 0%
Total N= 54	10 100%	7 100%	9 100%	17 100%	2 100%	9 100%

**Distribution of women according to treatment duration**

Figure 4 showed that out of 54, 26 (48.15%) were obtaining cosmetic procedures for ≤1 year and 28 (51.85%) for >1 year.

**Distribution of women according to the place in which they obtained the cosmetic treatment**

Figure 5 showed that out of 54, 28 (51.85%) women obtained their cosmetic procedures at a doctor clinic, 20 (37.04%) at a Beauty Salon, and 6 (11.11%) at both doctor clinic and Beauty Salon.

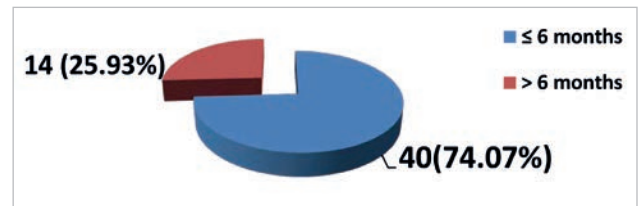


FIGURE 3. Distribution of women obtaining cosmetic procedures according to treatment intervals

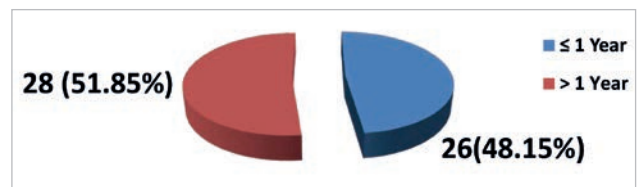


FIGURE 4. Distribution of women according to treatment duration

**Distribution of woman obtaining cosmetic procedures according to their information and side effects**

Figure 6 showed that out of 54, 15 (27.78%) have some information about these cosmetic procedures and 39 (72.22%) have no information about these procedure.

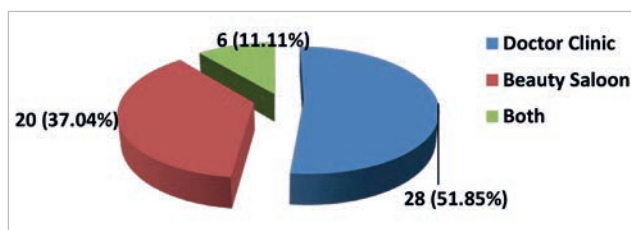


FIGURE 5. Distribution of women according to the place in which they obtained the cosmetic treatment

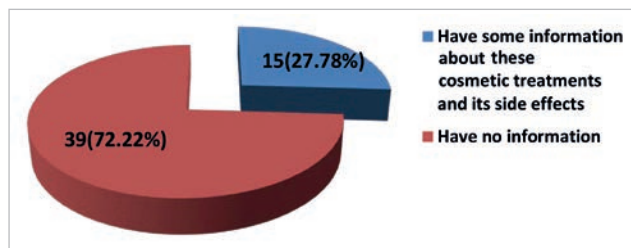


FIGURE 6. Distribution of woman obtaining cosmetic procedures according to their information side effects

**Distribution of women obtaining cosmetic procedures according to marital status**

Figure 7 showed that out of 54 women having cosmetic procedures, 37(68.52%) were married and 17 (31.48%) single.

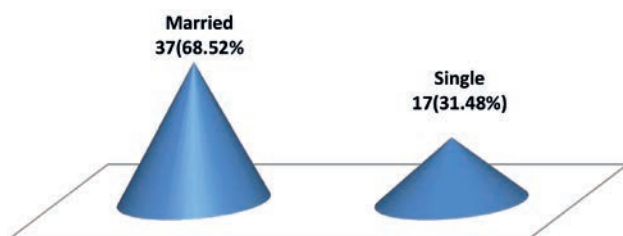


FIGURE 7. Distribution of women obtaining cosmetic procedures according to marital status

**Distribution of women having no cosmetic procedures according to their knowledge of these procedures**

Table 3 showed the distribution of women having no cosmetic procedures, but have some information about these procedures. 12 (63.16%) were within age group ( $\leq 30$ ), 10 (37.04%) within age group ( $>30$ ), 10 (35.71%) were married, 12 (66.67%) were single, 13 (56.52%) having job, 9 (64.29%) were students and no woman who have no job had any information about these procedures.

**Distribution of women having no cosmetic procedures according to their knowledge of side effects**

4 (21.05%) of the women who have no information about the side effects of these cosmetic procedures, were within age group ( $\leq 30$ ), 6 (22.22%) within age group ( $>30$ ), 7 (25%) were married, 3 (16.67%) were single, 8 (34.78%) having job, 2 (14.29%) were students and no woman who have no job had any information about the side effects of these procedures (Table 4).

**Platelet count in whole blood and in PRP samples**

Table 5 illustrate the reading of platelets count in PRP samples. Platelets count in stage 1 sample from woman no.1 was  $373 \times 10^9/L$ , while in stage 2 sample was  $724 \times 10^9/L$ , the mean of the two readings was ( $433 \times 10^9/L$ ). Platelets count in whole blood of woman no.1 was ( $202 \times 10^9/L$ ). Also results in Table 5 showed that platelets count in stage 1 sample from woman no.2 was  $413 \times 10^9/L$ , while in stage 2 sample was  $808 \times 10^9/L$ , the mean of the two readings was ( $513 \times 10^9/L$ ). Platelets count in whole blood of woman no.2 was  $320 \times 10^9/L$ . There was statistically significant increase in platelets count in stage 1 and stage 2 in both samples (P-value= 0.05).

TABLE 3. Distribution of women having no cosmetic procedures according to their knowledge of these procedures

Women have no cosmetic procedures N=46		Have some information about these procedures	Have no information about these procedures	Chi	OD	95% CI
*Age group	$\leq 30$ N= 19	12 (63.16%)	7 (36.84%)	3.05	2.91	0.86-9.83
	$>30$ N= 27	10 (37.04%)	17 (62.96%)			
*Marital status	Married N= 28	10 (35.71%)	18 (64.29%)	4.21	0.28	0.08-8.97
	Single N= 18	12 (66.67%)	6 (33.33%)			
*Job status	Having job N= 23	13 (56.52%)	10 (43.48%)	10.47	NA	NA
	Student N=14	9 (64.29%)	5 (35.71%)			
	Have no job N= 9	0 (0%)	9 (100%)			

**TABLE 4.** Distribution of women having no cosmetic procedures according to their knowledge of side effects

Women have no cosmetic procedures N=46		Have some information about side effects	Have no information about side effects	Chi	OD	95% CI
*Age group	≤30 N= 19	4 (21.05%)	15 (78.95%)	0.01	0.93	0.22-3.89
	>30 N= 27	6 (22.22%)	21(77.78%)			
*Marital status	Married N= 28	7 (25%)	21(75%)	0.45	1.67	0.37-7.52
	Single N= 18	3 (16.67%)	15 (83.33%)			
*Job status	Having job N= 23	8 (34.78%)	15 (65.22%)	5.26	NA	NA
	Student N=14	2 (14.29%)	12 (85.71%)			
	Have no job N= 9	0 (0%)	9 (100%)			

**TABLE 5.** Platelet count in whole blood and in PRP samples

Specimen	*Platelets count in PRP sample		Platelets count in whole blood sample	Mean × 10 <sup>9</sup> /L Std. Deviation
Specimens from woman no.1	Stage1	373 × 10 <sup>9</sup> /L	202 × 10 <sup>9</sup> /L	Stage1 & Stage2 548.5 248.19448
	Stage2	724 × 10 <sup>9</sup> /L		
Specimens from woman no.2	Stage1	413 × 10 <sup>9</sup> /L	320 × 10 <sup>9</sup> /L	Stage1 & Stage2 610.5 279.30718
	Stage2	808 × 10 <sup>9</sup> /L		
*P value = 0.05				

## DISCUSSION

Dermatology and health experts’ opinion is that improving the diet can make the skin looks young and healthy. Omega-3, fruits, and many healthy foods delay the appearance of wrinkles in the skin. The increasing demands on obtaining cosmetic procedures all over the world and especially in Iraq encouraged us to do this study. 2012 marked high number of cosmetic injections to date in United States, with 6.1 million injections [17]. The results of present study showed that the frequency of women within age group (>30) having Botox cosmetic treatment only is higher than the frequency of women within age group (≤30), while the frequency of women within age group (≤30) having Filler cosmetic treatment only is higher than the frequency of women within age group (>30). Plasma injections cosmetic treatment was more frequent among women within the age group (≤30). These results indicated that women within age group (≤ 30) prefer to do cosmetic treatment even if they do not need that. We think that there are many factors related to their interest in cosmetic treatment such as media [18], low self-confidence, effect of friends or the family. The present study indicated that frequency of cosmetic treatment with Botox,

Filler, and Plasma injections is higher in women having a job than the frequency of students and women having no job, the high income might be one of the reasons for this. Married women showed higher frequency (68.52%) than single women (31.48%). Also 74.07% of women were obtaining cosmetic procedures in intervals of ≤6 months while 25.93% in intervals of >6 months. These findings need attention to that point that frequent cosmetic procedures in intervals of ≤6 months might have adverse effects such as the development of antibodies to botulinum neurotoxins (Botox) [19]. The frequency of women obtaining cosmetic treatment for >1 year was higher than those for ≤1 year. These findings indicated increasing of cosmetic procedures in Basrah recently. The data of the present study indicated that most of women (51.85%) obtained their cosmetic treatment in doctor clinic, 37.04% in beauty salon, and 11.11% in both doctor clinic and beauty salon. These results indicated the presence of awareness and confidence that doing these cosmetic treatments in doctor clinic is safer than beauty salon, because it is done with caution and with scientific biases. In some salons, women might be injected with inappropriate preparation of botulinum toxin for example and by untrained hands, leading to adverse and dangerous ef-

fects [20]. Dermal filler considered as FAD approved cosmetic device and there are many researches for studying sterility of the dermal filler [21]. The present study indicated that only 27.78% have some information about cosmetic treatment and its side effects, while 72.22% of women have no information about it. It is very important for women obtaining cosmetic treatment to know more information and the side effects of these procedures in order to be aware about any adverse effect after these treatments [22]. Women having no cosmetic procedures, but have some information about these procedures. 63.16% were within age group ( $\leq 30$ ), 37.04% within age group ( $> 30$ ), 35.71% were married, 66.67% were single, 56.52% having job, 64.29% were students and no woman who have no job had any information about these procedures. Women who have no information about the side effects of these cosmetic procedures, 21.05% were within age group ( $\leq 30$ ), 22.22% within age group ( $> 30$ ), 25% were married, 16.67% were single, 34.78% having job, 14.29% were students and no woman who have no job had any information about the side effects of these procedures. We noticed from these results that most women having no job have no information about these cosmetic procedures. In addition to its usage in cosmetic procedures, PRP injection considered as an option to treat alopecia [23]. In the present study we studied the platelets count in PRP samples. Although platelet count studied in only two women obtaining plasma injections in the present study, but the results of plasma injections indicated that using Regen Kit BCT A-PRP was successful in obtaining concentrated PRP from woman's blood sample, comparing with the normal platelets count in whole blood. There are many kits and devices for obtaining PRP with different ability to getting sufficient active platelets concentrations [24]. Platelets count in stage 2 samples from both women was higher than stage 1 samples. There was statistically significant increase in platelets count in stage 1 and stage 2 in both samples ( $P$ -value=0.05). These results explain that increasing the speed and period of centrifugation might

give high concentrate of PRP. Centrifugation process must be done with sterile conditions and avoid lysing or damaging platelets in order to get more benefits from the released platelets growth factors [24].

## CONCLUSIONS

Women within age group ( $\leq 30$ ) prefer to do cosmetic treatment even if they do not need that. Also results indicated the presence of awareness and confidence that doing these cosmetic treatments in doctor clinic is safer than beauty salon, because it is done with caution and with scientific biases. The results of PRP platelets count indicated that using Regen Kit BCT A-PRP was successful in obtaining concentrated PRP from woman's blood sample, comparing with the normal platelets count in whole blood. Results also explained that increasing the speed and period of centrifugation in the method of Regen Kit BCT A-PRP might give high concentrate of PRP.

## Recommendations

It is very important for women obtaining cosmetic treatment to know more information and the side effects of these procedures in order to be aware about any adverse effect after these treatments. It is very important to know the best and safest kind of commercial Botox or filler before use. We think that it is important to test the viability and count of active platelets in the PRP specimen before injection. Further research should be done to know the future effects of these cosmetic treatments on the skin or tissues.

*Acknowledgements:* We thank Dr. Alaa Husien Al-Farhan for his cooperation in providing us with samples of PRP. Also we thank Dr. Sadiq Ali for his cooperation in counting platelets.

*Conflict of interest:* All authors declare no conflicts of interest.

*Financial support:* none

## REFERENCES

- Al Doheyan T, Al Saad A, Al Haidar A, Al Fwzan H, Al Askar J, Al Malki F, et al. Knowledge, Attitude and Practices concerning cosmetic surgery among female medical students at the university Hospital, King Saud University, Riyadh, Saudi Arabia. *J Adv Med Med Res.* 2016;14(4):1-10. <http://doi.org/10.9734/BJMMR/2016/22887>
- Swami V, Chamorro-Premuzic T, Bridges S, Furnham A. Acceptance of cosmetic surgery: personality and individual difference predictors. *Body Image.* 2009 Jan;6(1):7-13. <http://doi.org/10.1016/j.bodyim.2008.09.004>
- Markey C, Markey P. Correlates of young women's interest in obtaining cosmetic surgery. *Sex Roles.* 2009;1:158-66. <http://doi.org/10.1007/s11199-009-9625-5>
- Edmond A. The poor have the right to be beautiful: Cosmetic surgery in neoliberal Brazil. *J R Anthropol Inst.* 2007;13:363-81. <http://doi.org/10.1111/j.1467-9655.2007.00427.x>
- Ashkenazi A. Botulinum toxin type a for chronic migraine. *Curr Neural Neurosci Rep.* 2010 Mar;10(2):140-6. <http://doi.org/10.1007/s11910-010-0087-5>
- Montecucco C, Molgó J. Botulinum neurotoxins: revival of an old killer. *Curr Opin Pharmacol.* 2005 Jun;5(3):274-9. <http://doi.org/10.1016/j.coph.2004.12.006>
- Bray D, Hopkins C, Roberts DN. A review of dermal fillers in facial plastic surgery. *Curr Opin Otolaryngol Head Neck Surg.* 2010 Aug;18(4):295-302. <http://doi.org/10.1097/MOO.0b013e32833b5162>

8. Hom DB, Linzie BM, Huang TC. The healing effects of autologous platelet gel on acute human skin wounds. *Arch Facial Plast Surg*. 2007 May-Jun;9(3):174-83. <http://doi.org/10.1001/archfaci.9.3.174>
9. Cervelli V, Garcovich S, Bielli A, Cervelli G, Curcio BC, Scioli MG, et al. The effect of autologous activated platelet rich plasma (AA-PRP) injection on pattern hair loss: clinical and histomorphometric evaluation. *Biomed Res Int*. 2014;2014:760709. <http://doi.org/10.1155/2014/760709>
10. Shin MK, Lee JH, Lee SJ, Kim NI. Platelet-rich plasma combined with fractional laser therapy for skin rejuvenation. *Dermatol Surg*. 2012 Apr;38(4):623-30. <http://doi.org/10.1111/j.1524-4725.2011.02280.x>
11. Redaelli A, Romano D, Marciánó A. Face and neck revitalization with platelet-rich plasma (PRP): clinical outcome in a series of 23 consecutively treated patients. *J Drugs Dermatol*. 2010 May;9(5):466-72.
12. Coté TR, Mohan AK, Polder JA, Walton MK, Braun MM. Botulinum toxin type A injections: adverse events reported to the US Food and Drug Administration in therapeutic and cosmetic cases. *J Am Acad Dermatol*. 2005 Sep;53(3):407-15. <http://doi.org/10.1016/j.jaad.2005.06.011>
13. Edwards PC, Fantasia JE. Review of long-term adverse effects associated with the use of chemically-modified animal and nonanimal source hyaluronic acid dermal fillers. *Clin Interv Aging*. 2007;2(4):509-19. <http://doi.org/10.2147/cia.s382>
14. Beer K, Avelar R. Relationship between delayed reactions to dermal fillers and biofilms: facts and considerations. *Dermatol Surg*. 2014 Nov;40(11):1175-9. [10.1097/01.DSS.0000452646.76270.53](http://doi.org/10.1097/01.DSS.0000452646.76270.53)
15. Hall MP, Band PA, Meislin RJ, Jazrawi LM, Cardone DA. Platelet-rich plasma: current concepts and application in sports medicine. *J Am Acad Orthop Surg*. 2009 Oct;17(10):602-8. <http://doi.org/10.5435/00124635-200910000-00002>. Erratum in: *J Am Acad Orthop Surg*. 2010 Jan;18(1):17A.
16. Khatu SS, More YE, Gokhale NR, Chavhan DC, Bendsure N. Platelet-rich plasma in androgenic alopecia: myth or an effective tool. *J Cutan Aesthet Surg*. 2014 Apr;7(2):107-10. <http://doi.org/10.4103/0974-2077.138352>
17. American Society of Plastic Surgeons, 2012 Plastic Surgery Statistics Report. [chrome-extension://efaidnbmnnnibpajccglclefindmkaj/ https://www.plasticsurgery.org/documents/News/Statistics/2012/plastic-surgery-statistics-full-report-2012.pdf](http://www.plasticsurgery.org/documents/News/Statistics/2012/plastic-surgery-statistics-full-report-2012.pdf)
18. Crockett RJ, Pruzinsky T, Persing JA. The influence of plastic surgery "reality TV" on cosmetic surgery patient expectations and decision making. *Plast Reconstr Surg*. 2007 Jul;120(1):316-324. <http://doi.org/10.1097/01.prs.0000264339.67451.71>
19. Naumann M, Boo LM, Ackerman AH, Gallagher CJ. Immunogenicity of botulinum toxins. *J Neural Transm (Vienna)*. 2013 Feb;120(2):275-90. <http://doi.org/10.1007/s00702-012-0893-9>
20. Souayah N, Karim H, Kamin SS, McArdle J, Marcus S. Severe botulism after focal injection of botulinum toxin. *Neurology*. 2006 Nov 28;67(10):1855-6. <http://doi.org/10.1212/01.wnl.0000244417.34846.b6>
21. Bellew SG, Carroll KC, Weiss MA, Weiss RA. Sterility of stored nonanimal, stabilized hyaluronic acid gel syringes after patient injection. *J Am Acad Dermatol*. 2005 Jun;52(6):988-90. [doi: 10.1016/j.jaad.2005.01.131](http://doi.org/10.1016/j.jaad.2005.01.131).
22. Vedamurthy M, Vedamurthy A, Nischal K. Dermal Fillers: Do's and Don't's. *J Cutan Aesthet Surg*. 2010 Jan;3(1):11-5. <http://doi.org/10.4103/0974-2077.63221>
23. Schiavone G, Raskovic D, Greco J, Abeni D. Platelet-rich plasma for androgenetic alopecia: a pilot study. *Dermatol Surg*. 2014 Sep;40(9):1010-9. <http://doi.org/10.1097/01.DSS.0000452629.76339.2b>
24. Marx RE. Platelet-rich plasma: evidence to support its use. *J Oral Maxillofac Surg*. 2004 Apr;62(4):489-96. <http://doi.org/10.1016/j.joms.2003.12.003>