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ORIGINAL RESEARCH

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Impact of COVID-19 on facial plastic surgery volumes: A large database analysis of pre- and post-pandemic trends

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Abstract

Objective: During the COVID-19 pandemic, elective surgeries faced cancelations due to quarantine measures. The objective of this study was to assess facial plastic and reconstructive surgery (FPRS) volume before, during, and after the height of the pandemic on a national scale.

Methods: The TriNetX Research Network identified 68,101,098 individuals aged 18+ with healthcare interactions from 2017 to 2022. Rates of common FPRS surgeries and procedures were compared during March–August of each year, aligning with the pandemic lockdown.

Results: Compared to immediately before the pandemic in 2019, the 2020 pandemic peak saw an overall surgical volume reduction of −36.8%, with specific surgeries decreasing significantly: rhinoplasty (−28.6%), septoplasty (−34.0%), rhytidectomy (−54.9%), blepharoplasty (−40.7%), brow lift (−43.8%), ectropion/entropion repair (−35.6%), repair of blepharoptosis (−45.6%), correction of lagophthalmos (−29.9%), correction of lid retraction (−36.8%), and lipectomy (−41.8%) ($p < .001$). The procedural volume also decreased by 28.6%, encompassing reductions in various procedures: botulinum toxin A (−18.7%), facial filler (−40.7%), dermabrasion (−62.3%), chemical peel (−36.6%), and intralesional injection (−33.3%) ($p < .001$). In contrast to 2020, 2021 witnessed an increase of +75.0% in total surgical and +61.3% procedural volume: rhinoplasty (+81.0%), septoplasty (+74.7%), rhytidectomy (+143.4%), blepharoplasty (+81.7%), brow lift (+64.5%), ectropion/entropion repair (+55.2%), repair of blepharoptosis (+62.7%), correction of lagophthalmos (+39.0%), correction of lid retraction (+73.0%), lipectomy (+121.2%), botulinum toxin A (+52.4%), filler (+59.6%), dermabrasion (+91.8%), chemical peel (+78.8%), and intralesional injection (+67.3%) ($p < .001$). In 2022, rates of total surgeries (+8.5%) and procedures (+12.8%) surpassed pre-pandemic levels from 2019 ($p < .001$).

Conclusions: FPRS experienced significant pandemic-induced decreases, followed by a notable recovery in subsequent years, with certain surgeries and procedures surpassing pre-pandemic levels.

Level of Evidence: 4.

KEYWORDS
COVID-19, facial plastic surgery, surgical trends, surgical volume

1 | INTRODUCTION

The COVID-19 pandemic transformed the landscape of healthcare, presenting unparalleled challenges that extended beyond the direct impact of the virus itself.[1] One such collateral effect was the widespread disruption of elective surgeries and procedures as healthcare systems nationwide grappled with the urgent need to prevent the transmission of the virus and prioritize the care of COVID-19 patients.[2] In March of 2020, the American Academy of Facial Plastic and Reconstructive Surgery (AAFPRS) recommended the postponement of elective surgical and non-essential procedures due to quarantine measures and resource constraints.[3] In addition, certain facial plastic and reconstructive surgeries (FPRS), such as rhinoplasty, posed an increased risk of aerosolizing the virus.[4] Across all surgical specialties, it has been estimated that over 28 million elective operations were canceled or postponed worldwide during the 12-week peak of the pandemic.[5]

As society transitioned past the pandemic in recent years, restrictions were lifted, and elective cases were resumed. Preliminary analyses of Internet and social media search trends have indicated that there may be heightened public interest in FPRS compared to before the pandemic.[6–10] The authors have anecdotally noticed a post-pandemic increase in case volumes, possibly attributed to the phenomenon of "Zoom dysmorphia," where individuals become more critical of their appearance due to the frequent use of video conferencing platforms.[11] In addition, the ability of patients to recover without the need for extensive public interaction may contribute to this rise.[12] However, to the authors' knowledge, no studies to date have analyzed case volume in this context on a national level. This study seeks to utilize a comprehensive database to investigate trends in FPRS volume before, during, and after the height of the COVID-19 pandemic on a national scale. This data will provide insights into how the pandemic has influenced the demand for FPRS.

2 | MATERIALS AND METHODS

The study data was obtained from the TriNetX Research Network (Cambridge, MA). TriNetX is a regularly refreshed, deidentified database with access to over 100 million electronic medical records from more than 75 large healthcare organizations (HCOs) across the United States.[13] Data generated by the Research Network includes aggregated counts of information from medical encounters on both an inpatient and outpatient basis. TriNetX complies with the Health Insurance Portability and Accountability Act. The Penn State Institutional Review Board reviewed and approved STUDY00018629 as exempt according to institutional policies and applicable federal regulations.

The TriNetX Research Network was queried using diagnosis (ICD-10) and procedure (CPT) codes to identify a cohort of patients 18 years of age and older who had contact with the healthcare system during 2017–2022. This cohort was intended to represent the general adult population. Then, the TriNetX Incidence and Prevalence Advanced Analytics Tool was utilized to determine the number of common FPRS surgeries and procedures that this cohort underwent during March–August from 2017 to 2022. Included FPRS surgeries were rhinoplasty, septoplasty, rhytidectomy, blepharoplasty, brow lift, ectropion/entropion repair, repair of blepharoptosis, correction of lagophthalmos, correction of lid retraction, and lipectomy. Procedures analyzed included botulinum toxin A injections, facial filler, dermabrasion, chemical peels, and intralesional injections. The ICD-10 and CPT codes utilized to execute these analyses are listed in Appendix A. It should be noted that although nonsurgical procedures were analyzed in the study, there was likely a significant volume conducted outside of large HCOs and not captured by the TriNetX Research Network. While restrictions varied by state, March–August was strategically selected as the timeframe of interest to correspond with the months of the initial pandemic lockdown in 2020 in the United States. Additional analyses were performed, including data for entire calendar years (January–December), to determine how the annual volume compared to the March–August figures.

2.1 | Statistical analysis

Relative risk ratios were calculated to compare the volume of common FPRS surgeries and procedures during the pre-pandemic, pandemic, and post-pandemic time windows, with associated 95% confidence intervals (CI) and p values. The provided data encompasses the years 2017–2022; however, when making statistical comparisons to pre-pandemic rates, the emphasis is placed on the year 2019, as it represents the immediate pre-pandemic period. Statistical significance was defined as $p < .05$. All analyses were performed within the TriNetX platform.

3 | RESULTS

A total cohort of 68,101,098 adult patients with contact with 86 HCOs during 2017–2022 was identified. The case volumes of each surgery and procedure during March–August of each year are presented in numeric form in Table 1 and graphically in Figure 1, respectively. Throughout the entirety of the study period, there were a total of 87,980 surgeries and 94,402 procedures. Septoplasty was the most commonly performed surgery (mean of 5902 operations during March–August of each year), followed by rhinoplasty (mean of 2440 operations per time window). Procedurally, intralesional injections were most frequently performed (mean of 8841 during March–August of each year), followed by botulinum toxin A injections (mean of 6137 per time window).

In the time periods preceding the pandemic, specifically from March to August 2017–2019, there was a rise in total surgeries and procedures, with increases of +24.7% and +5.1%, respectively (both $p < .001$). In comparison to 2019, in 2020, the total number of surgeries performed was significantly reduced by −36.8% at the height of the pandemic ($p < .001$). More specifically, there was a −28.6% reduction in the occurrence of rhinoplasty, −34.0% decrease in septoplasty, −54.9% decline in rhytidectomy, −40.7% drop in blepharoplasty, −43.8% decrease in brow lift, −35.6% drop in ectropion/entropion repair, −45.6% decline in the repair of blepharoptosis, −29.9% drop in correction of lagophthalmos, −36.8% reduction in correction of lid retraction, and −41.8% reduction in lipectomy (all $p < .001$). From a procedural standpoint, the total number of procedures significantly dropped by −28.6% in 2020 compared to 2019 ($p < .001$). Botulinum toxin A was reduced by −18.7%, filler by −40.7%, dermabrasion by −62.3%, chemical peel by −36.6%, and intralesional injection by −33.3% (all $p < .001$).

When comparing March–August 2020 to the first post-pandemic time window in 2021, total surgical volume increased by +75.0% and procedural volume by +61.3% (both $p < .001$). Rhinoplasty increased by +81.0%, septoplasty by +74.7%, rhytidectomy by +143.4%, blepharoplasty by +81.7%, brow lift by +64.5%, ectropion/entropion repair by +55.2%, repair of blepharoptosis by +62.7%, correction of lagophthalmos by +39.0%, correction of lid retraction by +73.0%, and lipectomy by +121.2% (all $p < .001$). Furthermore, chemodenervation rose by +52.4%, filler by +59.6%, dermabrasion by +91.8%, chemical peel by +78.8%, and intralesional injection by +67.3% (all $p < .001$).

In March–August 2022, there were −2.0% reductions in the number of total surgeries and procedures compared to 2021 ($p = .06$ and .05, respectively). However, total surgeries (+8.5%), total procedures (+12.8%), rhinoplasty (+22.4%), septoplasty (+16.6%), blepharoplasty (+10.0%), botulinum toxin A (+31.7%), and intralesional injections (+4.2%) were still significantly increased compared to immediate pre-pandemic rates in 2019 (all $p < .004$). The 2022 rates of rhytidectomy (−9.9%), ectropion/entropion repair (−4.7%), correction of lagophthalmos (−13.7%), lipectomy (+0.7%), and chemical peel (+2.7%) were not statistically different from 2019 (all $p > .05$), while brow lift (−10.4%), repair of blepharoptosis (−11.3%), correction of lid retraction (−23.8%), filler (−23.2%), and dermabrasion (−30.0%) were reduced (all $p < .03$).

Table 2 and Figure 2 display additional similar analyses covering entire calendar years (January–December). Significant increases of +23.2% and +7.8% in total surgical and procedural volume were observed when comparing 2017–2019 (both $p < .001$). Conversely, declines of −17.2% and −10.9% in total surgeries and procedures occurred in 2020 compared to 2019 (both $p < .001$), driven by noteworthy decreases in each specific surgery and procedure (all $p < .02$), with the exception of chemical peels ($p = .82$). In the transition from 2020 to 2021, there was a resurgence, with overall surgeries increasing by +26.9% and procedures by +23.1% (both $p < .001$). Every individual surgery and procedure experienced a significant uptick in 2021 ($p < .05$), except for correction of lagophthalmos, which increased by +13.0% but did not achieve statistical significance ($p = .08$). In 2022, there was an overall increase of +1.8% for surgeries and reduction of −1.4% for procedures compared to 2021 ($p = .02$ and .06, respectively). Comparing 2022 to the immediate pre-pandemic year in 2019, there was an increase of +7.0% in total surgeries and +8.1% in total procedures (both $p < .001$). Specifically, in 2022, rhinoplasty increased by +17.0%, septoplasty by +13.3%, blepharoplasty by 11.0%, and botulinum toxin A by +26.8% compared to 2019 (all $p < .001$). However, no significant differences were observed in rhytidectomy (−7.0%), ectropion/entropion repair (−5.5%), correction of lagophthalmos (−8.4%), lipectomy (+1.1%), chemical peel (−11.3%), and intralesional injections (−0.2%) (all $p > .05$). Noteworthy significant reductions were identified in brow lift (−6.9%), repair of blepharoptosis (−9.5%), correction of lid retraction (−24.7%), filler (−31.5%), and dermabrasion (−35.6%) (all $p < .04$).

4 | DISCUSSION

The observed trends in FPRS volume during 2017–2022 unveil intriguing dynamics in healthcare utilization. During March–August of 2020, corresponding with the peak of the pandemic, total surgical volume was reduced by nearly −40% and procedural volume by a third, with significant reductions in every individual surgery and procedure analyzed. This was followed by notable post-pandemic increases of +75% for total surgeries and +61% for procedures in 2021 compared to 2020. In March–August 2022, total surgeries and procedures continued to exceed those rates observed before the pandemic onset by about 10%.

Several factors may have contributed to these trends. First, the impact of the pandemic is evident in the substantial reductions across various surgeries and procedures in 2020, reflecting limitations in elective surgery during the initial stages of the public health emergency.[3,5] In conjunction with restrictive hospital policies, there may have also been a reluctance among patients to pursue elective facial surgeries during this period, possibly influenced by virus-related concerns,[14] financial constraints, or a shift in priorities.

Nonetheless, there was a pronounced resurgence in the incidence of all surgeries and procedures in 2021. This initial substantial

TABLE 1 Case volumes of common FPRS *surgeries* and *procedures* during March–August of years 2017–2022 before, during, and after the COVID-19 pandemic.

Surgery	2017 Cases	2018 Cases (% change)	RR (95% CI)	*p* Value	2019 Cases (% Change)	RR (95% CI)	*p* Value	2020 Cases (% Change)	RR (95% CI)	*p* Value	2021 Cases (% Change)	RR (95% CI)	*p* Value	2022 Cases (% Change)	RR (95% CI)	*p* Value
Total surgery	12,754	14,439 (+13.2%)	1.13 (1.11–1.16)	**<.001**	15,898 (+10.1%)	1.10 (1.08–1.13)	**<.001**	10,054 (−36.8%)	0.63 (0.62–0.65)	**<.001**	17,590 (+75.0%)	1.75 (1.71–1.79)	**<.001**	17,245 (−2.0%)	0.98 (0.96–1.0)	.06
Rhinoplasty	1939	2315 (+19.4%)	1.19 (1.12–1.27)	**<.001**	2455 (+6.0%)	1.06 (1.00–1.12)	**.04**	1753 (−28.6%)	0.71 (0.67–0.76)	**<.001**	3173 (+81.0%)	1.81 (1.71–1.92)	**<.001**	3004 (−5.3%)	0.95 (0.90–1.0)	**.03**
Septoplasty	5009	5582 (+11.4%)	1.11 (1.07–1.16)	**<.001**	6237 (+11.7%)	1.12 (1.08–1.16)	**<.001**	4117 (−34.0%)	0.66 (0.63–0.69)	**<.001**	7193 (+74.7%)	1.75 (1.68–1.82)	**<.001**	7273 (+1.1%)	1.01 (0.98–1.04)	.51
Rhytidectomy	456	489 (+7.2%)	1.07 (0.94–1.22)	.28	506 (+3.5%)	1.03 (0.91–1.17)	.59	228 (−54.9%)	0.45 (0.39–0.53)	**<.001**	555 (+143.4%)	2.43 (2.09–2.84)	**<.001**	456 (−17.8%)	0.82 (0.73–0.93)	**.002**
Lower/upper blepharoplasty	1869	2191 (+17.2%)	1.17 (1.10–1.25)	**<.001**	2309 (+5.4%)	1.05 (0.99–1.12)	.08	1369 (−40.7%)	0.59 (0.55–0.63)	**<.001**	2487 (+81.7%)	1.82 (1.70–1.94)	**<.001**	2541 (+2.2%)	1.02 (0.97–1.08)	.45
Brow lift/ repair of brow ptosis	560	724 (+29.3%)	1.29 (1.16–1.26)	**<.001**	847 (+17.0%)	1.17 (1.06–1.29)	**.002**	476 (−43.8%)	0.56 (0.50–0.63)	**<.001**	783 (+64.5%)	1.64 (1.47–1.84)	**<.001**	759 (−3.1%)	0.97 (0.88–1.07)	.54
Repair of ectropion/ entropion	970	1123 (+15.8%)	1.16 (1.06–1.26)	**<.001**	1231 (+9.6%)	1.10 (1.01–1.19)	**.03**	793 (−35.6%)	0.64 (0.59–0.70)	**<.001**	1231 (+55.2%)	1.55 (1.42–1.70)	**<.001**	1173 (−4.7%)	0.95 (0.88–1.03)	.24
Repair of Blepharoptosis	1403	1512 (+7.8%)	1.08 (1.0–1.16)	**.04**	1740 (+15.1%)	1.15 (1.07–1.23)	**<.001**	947 (−45.6%)	0.54 (0.50–0.59)	**<.001**	1541 (+62.7%)	1.63 (1.50–1.76)	**<.001**	1543 (+0.1%)	1.00 (0.93–1.07)	.97
Correction of lagophthalmos	202	206 (+2.0%)	1.02 (0.84–1.24)	.84	234 (+13.6%)	1.14 (0.94–1.37)	.18	164 (−29.9%)	0.70 (0.57–0.86)	**<.001**	228 (+39.0%)	1.39 (1.14–1.70)	**.001**	202 (−11.4%)	0.89 (0.73–1.07)	.21
Correction of lid retraction	210	158 (−24.8%)	0.75 (0.61–0.92)	**.007**	193 (+22.2%)	1.22 (0.99–1.51)	.06	122 (−36.8%)	0.63 (0.50–0.79)	**<.001**	211 (+73.0%)	1.73 (1.38–2.16)	**<.001**	147 (−30.3%)	0.70 (0.56–0.86)	**<.001**
Suction-assisted lipectomy	136	139 (+2.2%)	1.02 (0.81–1.29)	.86	146 (+5.0%)	1.05 (0.83–1.32)	.68	85 (−41.8%)	0.58 (0.45–0.76)	**<.001**	188 (+121.2%)	2.21 (1.71–2.86)	**<.001**	147 (−21.8%)	0.78 (0.63–0.97)	**.03**
Total procedure[a]	15,213	15,319 (+0.7%)	1.01 (0.98–1.03)	.54	15,996 (+4.4%)	1.04 (1.02–1.07)	**<.001**	11,418 (−28.6%)	0.71 (0.70–0.73)	**<.001**	18,413 (+61.3%)	1.61 (1.58–1.65)	**<.001**	18,043 (−2.0%)	0.98 (0.96–1.0)	**.05**
Botox injection	5940	5992 (+0.9%)	1.01 (0.95–1.05)	.63	5697 (−4.9%)	0.95 (0.92–0.99)	**.006**	4631 (−18.7%)	0.81 (0.78–0.85)	**<.001**	7057 (+52.4%)	1.52 (1.47–1.58)	**<.001**	7502 (+6.3%)	1.06 (1.03–1.10)	**<.001**
Filler injection	682	573 (−16.0%)	0.84 (0.75–0.94)	**.002**	526 (−8.2%)	0.92 (0.82–1.03)	.16	312 (−40.7%)	0.59 (0.52–0.68)	**<.001**	498 (+59.6%)	1.60 (1.39–1.84)	**<.001**	404 (−18.9%)	0.81 (0.71–0.93)	**.002**
Dermabrasion	85	93 (+9.4%)	1.09 (0.82–1.47)	.55	130 (+39.8%)	1.40 (1.07–1.82)	**.01**	49 (−62.3%)	0.38 (0.27–0.52)	**<.001**	94 (+91.8%)	1.92 (1.36–2.71)	**<.001**	91 (−3.2%)	0.97 (0.73–1.29)	.83
Chemical peel	149	144 (−3.4%)	0.97 (0.77–1.22)	.77	186 (+29.2%)	1.29 (1.04–1.61)	**.02**	118 (−36.6%)	0.63 (0.50–0.80)	**<.001**	211 (+78.8%)	1.79 (1.43–2.24)	**<.001**	191 (−9.5%)	0.91 (0.74–1.10)	.32
Intralesional injection	8357	8517 (+1.9%)	1.02 (0.99–1.05)	.22	9457 (+11.0%)	1.11 (1.08–1.14)	**<.001**	6308 (−33.3%)	0.67 (0.65–0.69)	**<.001**	10,553 (+67.3%)	1.67 (1.62–1.73)	**<.001**	9855 (−6.6%)	0.93 (0.91–0.96)	**<.001**

Note: Each RR (95% CI) and *p* value compares the given year to the year prior.

Abbreviations: CI, confidence interval; RR, relative risk.

[a]The generalizability of the nonsurgical procedural volume is limited due to the significant volume of procedures conducted outside of large healthcare organizations and not captured by the TriNetX Research Network.

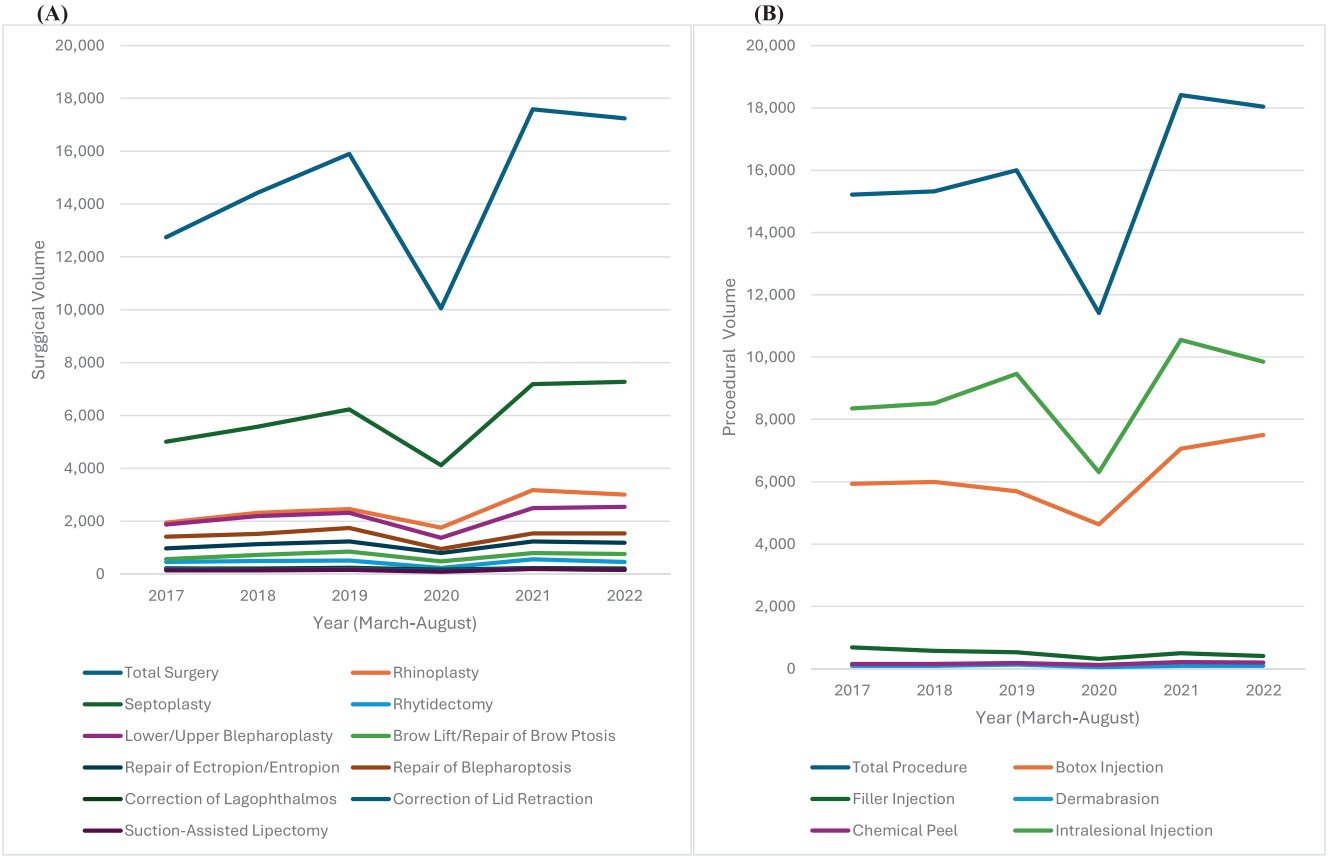

FIGURE 1 Graphical representation of case volumes of common FPRS (A) *surgeries* and (B) *procedures* during March–August of years 2017–2022 before, during, and after the COVID-19 pandemic.

recovery in 2021 may signify a compensatory surge in volume aimed at addressing backlogged cases in addition to those regularly scheduled.[15] Particularly noteworthy is the fact that in March–August 2022, the most recent time window analyzed, the rates for total surgeries, total procedures, rhinoplasty, septoplasty, blepharoplasty, botulinum toxin A, and intralesional injections continued to surpass pre-pandemic levels. The sustained duration of the increase into 2022 could be indicative of increased patient demand and heightened willingness to undergo certain elective facial surgeries and procedures post-pandemic. Multiple studies investigated the evolving trends in public interest in FPRS during the COVID-19 pandemic using Google Trends and found a significantly greater interest in facial procedures after COVID-19.[6–10] Our study of case volume supports that increased online interest may have translated to volume for a number of surgeries and procedures, especially rhinoplasty, septoplasty, and botulinum toxin A injections, which had the most significant increases in both the analyses conducted on the months of March–August and for the entire calendar year. While we compared rates during the peak of the pandemic, it is important to note that extending the analysis to cover complete calendar years continued to reveal a notable increase in surgeries and procedures in 2022 compared to 2019.

Growth in demand and interest in FPRS may be attributed to shifts in individuals' daily lives and behaviors prompted by the pandemic. For one, the widespread adoption of stay-at-home measures and increased reliance on virtual platforms for work and social interactions have led individuals to scrutinize their facial appearance more closely through video conferencing.[16,17] Furthermore, there was a noticeable rise in the use of social media during this time,[18] a trend that has been thoroughly investigated for its influence on self-image.[19] One study based on general plastic surgery reported that the most common motivation for undergoing esthetic surgery was "the desire to look better after the pandemic."[20] In addition, many of the logistical aspects of undergoing surgery have been simplified. Patients now often have enhanced flexibility in work schedules and the ability to work remotely, providing individuals with increased privacy from colleagues and friends during the recovery period,[12] with the possibility of sooner return to work. The widespread adoption of telemedicine has also increased the convenience and accessibility of consultations and postoperative follow-up.[21] Aside from in-person visits immediately before and after surgery, many surgeons conduct telemedicine consultations and maintain longer-term follow-ups through remote visits. This practice remains prevalent among cosmetic surgeons who do not rely on traditional billing methods for in-person visits.

It should be noted that the March–August 2022 rates for rhytidectomy, ectropion/entropion repair, correction of lagophthalmos, lipectomy, and chemical peel matched pre-pandemic figures, implying stability in the demand for these specific interventions. Furthermore,

TABLE 2 Case volumes of common FPRS *surgeries* and *procedures* during entire calendar years 2017–2022 before, during, and after the COVID-19 pandemic.

	2017 Cases	2018 Cases (% Change)	RR (95% CI)	*p* Value	2019 Cases (% Change)	RR (95% CI)	*p* Value	2020 Cases (% Change)	RR (95% CI)	*p* Value	2021 Cases (% Change)	RR (95% CI)	*p* Value	2022 Cases (% Change)	RR (95% CI)	*p* Value
Total surgery	25,436	28,418 (+11.7%)	1.12 (1.10–1.14)	**<.001**	31,335 (+10.3%)	1.10 (1.09–1.12)	**<.001**	25,940 (−17.2%)	0.83 (0.81–0.84)	**<.001**	32,919 (+26.9%)	1.27 (1.25–1.29)	**<.001**	33,513 (+1.8%)	1.02 (1.0–1.03)	**.02**
Rhinoplasty	3859	4469 (+15.8%)	1.16 (1.11–1.21)	**<.001**	4832 (+8.1%)	1.08 (1.04–1.13)	**<.001**	4503 (−6.8%)	0.93 (0.89–0.97)	**<.001**	5912 (+31.3%)	1.31 (1.26–1.36)	**<.001**	5653 (−4.4%)	0.96 (0.92–0.99)	**.02**
Septoplasty	9981	11,014 (+10.3%)	1.10 (1.07–1.13)	**<.001**	12,309 (+11.8%)	1.12 (1.09–1.15)	**<.001**	10,490 (−14.8%)	0.85 (0.83–0.87)	**<.001**	13,467 (+28.4%)	1.28 (1.25–1.32)	**<.001**	13,946 (+3.6%)	1.04 (1.01–1.06)	**.004**
Rhytidectomy	923	959 (+3.9%)	1.04 (0.95–1.14)	.41	1008 (+5.1%)	1.05 (0.96–1.15)	.27	677 (−32.8%)	0.67 (0.61–0.74)	**<.001**	992 (+46.5%)	1.47 (1.33–1.62)	**<.001**	937 (−5.5%)	0.94 (0.86–1.03)	.21
Lower/upper blepharoplasty	3769	4298 (+14.0%)	1.14 (1.09–1.19)	**<.001**	4532 (+5.4%)	1.05 (1.01–1.10)	**.01**	3704 (−18.3%)	0.82 (0.78–0.85)	**<.001**	4671 (+26.1%)	1.26 (1.21–1.32)	**<.001**	5032 (+7.7%)	1.08 (1.04–1.12)	**<.001**
Brow lift/repair of Brow Ptosis	1131	1449 (+28.1%)	1.28 (1.19–1.38)	**<.001**	1689 (+16.6%)	1.17 (1.09–1.25)	**<.001**	1261 (−25.3%)	0.75 (0.69–0.80)	**<.001**	1548 (+22.8%)	1.23 (1.14–1.32)	**<.001**	1573 (+1.6%)	1.02 (0.95–1.09)	.66
Repair of ectropion/ entropion	1969	2125 (+7.9%)	1.08 (1.02–1.15)	**.02**	2409 (+13.4%)	1.13 (1.07–1.20)	**<.001**	1960 (−18.6%)	0.81 (0.77–0.86)	**<.001**	2231 (+13.8%)	1.14 (1.07–1.21)	**<.001**	2276 (+2.0%)	1.02 (0.96–1.08)	.50
Repair of blepharoptosis	2741	3054 (+11.4%)	1.11 (1.06–1.17)	**<.001**	3425 (+12.1%)	1.12 (1.07–1.18)	**<.001**	2448 (−28.5%)	0.71 (0.68–0.75)	**<.001**	2966 (+21.2%)	1.21 (1.15–1.28)	**<.001**	3099 (+4.5%)	1.04 (0.99–1.10)	.09
Correction of lagophthalmos	384	400 (+4.2%)	1.04 (0.91–1.20)	.57	443 (+10.8%)	1.11 (0.97–1.27)	.14	378 (−14.7%)	0.85 (0.74–0.98)	**.02**	427 (+13.0%)	1.13 (0.98–1.30)	.08	406 (−4.9%)	0.95 (0.83–1.09)	.47
Correction of lid retraction	413	366 (−11.4%)	0.89 (0.77–1.02)	.09	405 (+10.7%)	1.11 (0.96–1.27)	.16	309 (−23.7%)	0.76 (0.66–0.88)	**<.001**	366 (+18.4%)	1.18 (1.02–1.38)	**.03**	305 (−16.7%)	0.83 (0.72–0.97)	**.02**
Suction-assisted lipectomy	266	284 (+6.8%)	1.07 (0.90–1.26)	.44	283 (−0.4%)	1.00 (0.85–1.17)	.97	210 (−25.8%)	0.74 (0.62–0.89)	**.001**	339 (+61.4%)	1.61 (1.36–1.92)	**<.001**	286 (−15.6%)	0.84 (0.72–0.99)	**.03**
Total procedure[a]	29,326	29,920 (+2.0%)	1.02 (1.0–1.04)	**.02**	31,621 (+5.7%)	1.06 (1.04–1.07)	**<.001**	28,167 (−10.9%)	0.89 (0.88–0.91)	**<.001**	34,674 (+23.1%)	1.23 (1.21–1.25)	**<.001**	34,180 (−1.4%)	0.99 (0.97–1.0)	.06
Botox injection	11,360	11,320 (−0.4%)	1.00 (0.97–1.02)	.79	11,395 (+0.7%)	1.01 (0.98–1.03)	.62	10,940 (−4.0%)	0.96 (0.94–0.99)	**.002**	13,200 (+20.7%)	1.21 (1.18–1.24)	**<.001**	14,446 (+9.4%)	1.09 (1.07–1.12)	**<.001**
Filler injection	1193	1149 (−3.7%)	0.96 (0.89–1.04)	.36	1027 (−10.6%)	0.89 (0.82–0.97)	**.009**	793 (−22.8%)	0.77 (0.70–0.85)	**<.001**	913 (+15.1%)	1.15 (1.05–1.27)	**.004**	704 (−22.9%)	0.77 (0.70–0.85)	**<.001**
Dermabrasion	197	196 (−0.5%)	0.99 (0.82–1.21)	.96	275 (+40.3%)	1.40 (1.17–1.69)	**<.001**	141 (−48.7%)	0.51 (0.42–0.63)	**<.001**	183 (+29.8%)	1.30 (1.04–1.62)	**.02**	177 (−3.3%)	0.97 (0.79–1.19)	.75
Chemical peel	353	335 (−5.1%)	0.95 (0.82–1.10)	.49	353 (+5.4%)	1.05 (0.91–1.22)	.49	359 (+1.7%)	1.02 (0.88–1.18)	.82	413 (+15.0%)	1.15 (1.0–1.33)	**.05**	313 (−24.2%)	0.76 (0.65–0.88)	**<.001**
Intralesional injection	16,223	16,920 (+4.3%)	1.04 (1.02–1.07)	**<.001**	18,571 (+9.8%)	1.10 (1.07–1.12)	**<.001**	15,934 (−14.2%)	0.86 (0.84–0.88)	**<.001**	19,965 (+25.3%)	1.25 (1.23–1.28)	**<.001**	18,540 (−7.1%)	0.93 (0.91–0.95)	**<.001**

Note: Each RR (95% CI) and *p* value compares the given year to the year prior.

Abbreviations: CI, confidence interval; RR, relative risk.

[a]The generalizability of the nonsurgical procedural volume is limited due to the significant volume of procedures conducted outside of large healthcare organizations and not captured by the TriNetX Research Network.

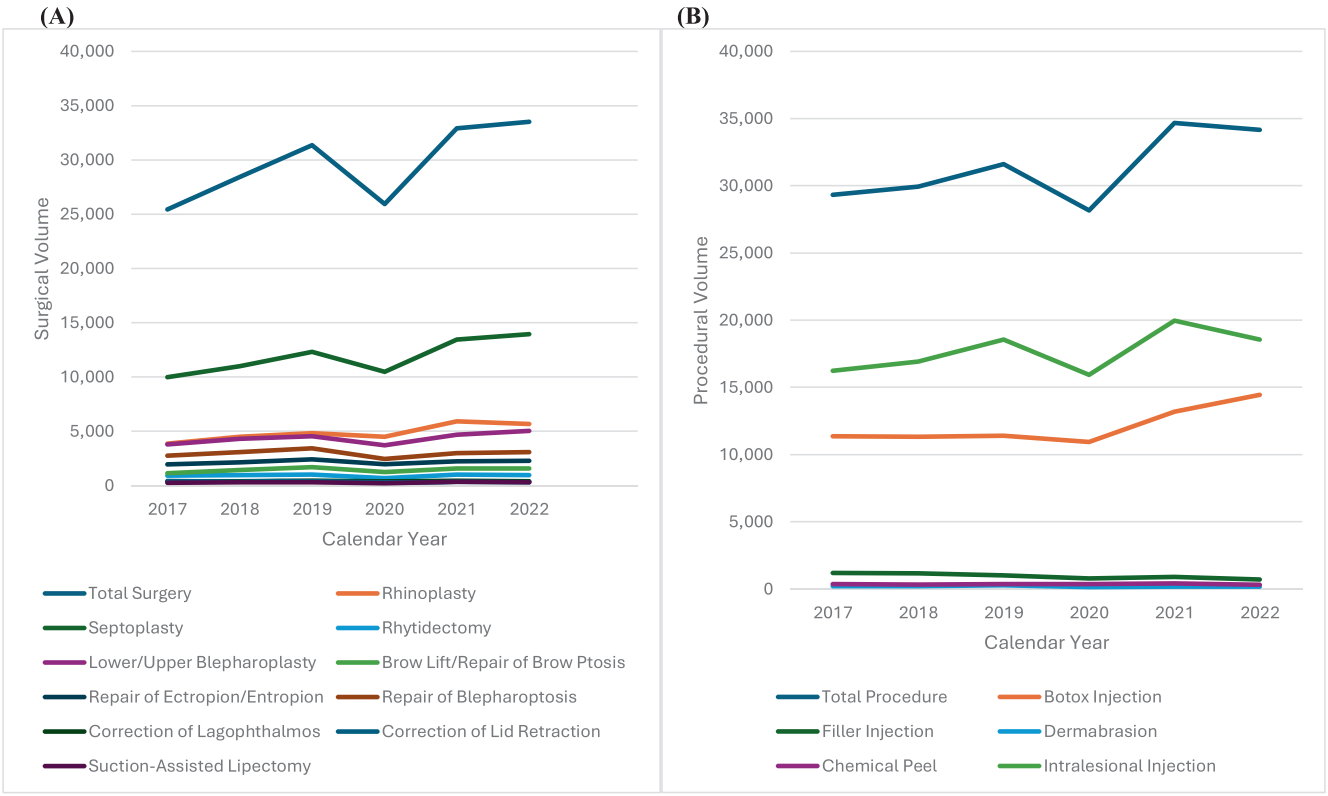

FIGURE 2 Graphical representation of case volumes of common FPRS (A) *surgeries* and (B) *procedures* during entire calendar years before, during, and after the COVID-19 pandemic.

brow lift, repair of blepharoptosis, correction of lid retraction, filler, and dermabrasion were reduced in 2022 compared to before the pandemic in 2019. Therefore, it should be noted that an increase in demand was not the case for every individual surgery and procedure. This could be attributed to changes in trends in popular culture and public perception.[22,23] The declines in certain injectables may be attributed to patients opting for non-physician injectors, facilitated by easier access, the influence of social media advertising, and the appeal of reduced exposure to "sick" individuals in a clinic setting.

While our study provides valuable insights into the trends of FPRS before, during, and after the COVID-19 pandemic, it is essential to acknowledge limitations. Firstly, the data relied on electronic medical records from the TriNetX Research Network, introducing potential biases and limitations inherent to retrospective analyses and database studies.[21,24] TriNetX primarily captures cases from large HCOs, overlooking those conducted in smaller, private, and purely cosmetic practices and limiting the generalizability of the results. Similarly, our study relied on CPT codes to identify cases, which may have failed to include those performed in some cosmetic settings where CPT codes are not utilized for billing. These limitations may have been especially relevant for a significant proportion of nonsurgical procedures including botulinum toxin A and fillers, which are often likely to be performed outside of the data capture from the TriNetX Research Network. Consequently, the generalizability of interpretations regarding our analysis of nonsurgical procedures must be tempered. Procedures conducted outside large HCOs and beyond the scope of the TriNetX Research Network may differ substantially from the patterns observed in this analysis of large institutional data. Furthermore, it was not possible to differentiate cosmetic (self-pay) from reconstructive (covered by insurance) procedures. Therefore, the influence of the pandemic on surgeries and procedures performed with cosmetic versus functional or reconstructive goals could not be commented on. Nevertheless, TriNetX is not limited to only those procedures covered by insurance and, therefore, likely captured cases where patients used alternative payment sources. As a result, our cohort likely includes a combination of functional and cosmetic surgeries and procedures. On that same note, while we limited our codes for botulinum toxin A injections to muscles of the head or neck, there are a variety of indications for botulinum toxin A in addition to cosmetics. Therefore, it is likely that some patients with other conditions warranting botulinum toxin A were included in this analysis. Despite these limitations, our study of millions of patients across the United States includes thousands of cases and contributes valuable insights into the changing dynamics of FPRS and patient needs.

The trends presented in this paper highlight the resilience and adaptability of the field of FPRS. The pandemic response can serve as a model to effectively manage disruptions in elective surgical services during any future public health crisis. As elective surgical operations resumed during the initial reopening, best-practice protocols

encompassing office-based, intraoperative, and postoperative care were implemented to ensure a safe environment for patients and staff.[25] Subsequently, during the recovery phase, adjustments were made to accommodate increased patient volume and evolving demands, with many of these adaptations persisting beyond the pandemic due to their beneficial effects.[26] Moving forward, irrespective of public health emergencies, our field should remain committed to ongoing enhancements to meet the evolving needs of patients and improve the patient experience.

Future research should aim to delineate case volumes specific to private and cosmetic settings, as shifts in the distribution of functional versus cosmetic surgeries remain unclear. It is possible that the pandemic may have resulted in a rise in surgeries with cosmetic intent and less of an increase or no difference in functional operations. Finally, investigations should delve deeper into the multifaceted factors shaping patient choices and healthcare utilization in the post-pandemic era. By exploring patient demographics, socioeconomic variables, and cultural influences, a more comprehensive understanding of the observed patterns can be attained.

5 | CONCLUSION

In conclusion, our study highlights dynamic trends in FPRS before, during, and after the COVID-19 pandemic. The initial impact of the pandemic resulted in significant reductions, however, from 2020 to 2022, there was a noticeable rebound, with certain surgeries and procedures surpassing pre-pandemic rates. As our specialty continues to move past the pandemic, it is crucial to comprehend the needs of patients to effectively respond to evolving demands in patient care.

AUTHOR CONTRIBUTIONS

F. Jeffrey Lorenz: Conceptualization (supporting); methodology (equal); formal analysis (lead); writing—original draft (lead). **Andrew J. Rothka:** Conceptualization (equal); methodology (equal); writing—review and editing (equal). **Heather K. Schopper:** Conceptualization (equal); methodology (equal); writing—review and editing (equal). **Jessyka G. Lighthall:** Conceptualization (equal); methodology (equal); writing—review and editing (equal).

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

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APPENDIX A: ICD-10 AND CPT CODES OF COMMON FPRS SURGERIES AND PROCEDURES

Surgeries

Rhinoplasty: 1005721 (includes 30400, 30410, and 30420), 1005725 (includes 30430, 30435, 30450), 1005729 (includes 30460 and 30462), 30465.

Septoplasty: 30520.

Rhytidectomy: 1003504 (includes 15828 and 15829).

Brow lift/repair of brow ptosis: 67900.

Lower/upper blepharoplasty: 1014047, 1014048 (includes 15820-15824).

Repair of ectropion/entropion: 1010023 (includes 67914-67917), 1010028 (includes 67921-67924).

Repair of blepharoptosis: 1010013 (includes 67901, 67902, 67903, 67904, 67906, 67908).

Correction of lagophthalmos with upper eyelid lid load: 67912.

Correction of lid retraction: 67911.

Suction-assisted lipectomy, head and neck: 15876, 15838.

Procedures

Chemodenervation of face/neck muscles: 64612, 64615, 64616.

Facial filler: 1003293 (includes 11950–11954).

Chemical peel of face: 1003493 (includes 15788 and 15789).

Dermabrasion of face: 15780, 15781.

Intralesional injection: 11900.