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Labial Frenectomy: Current Clinical Practice Among a Sample of Oral Surgeons and Oral and Maxillofacial Surgeons in the United Kingdom

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ABSTRACT

Introduction: The aim of this study was to obtain the views of oral surgeons (OS) and oral and maxillofacial surgeons (OMFS) in the United Kingdom on labial frenectomies regarding their indication, timing and preferred surgical techniques.

Materials and Methods: This was a cross-sectional, questionnaire-based study. A 20-item online questionnaire was sent to both OS and OMFS by distribution through the British Association of Oral Surgeons (BAOS) and British Association of Oral and Maxillofacial Surgeons (BAOMS). It included demographics of respondents, diagnostic methods for aberrant labial frenums as well as their preferred timing, surgical techniques, and instruments for labial frenectomies. Descriptive statistics were used to summarise the study sample characteristics and questionnaire responses.

Results: One hundred and thirty-nine OS and 41 OMFS responded to the questionnaire with a response rate of 18.3% and 3.4% respectively. 84.4% of OS and 68.3% of OMFS believed that a low and hypertrophic frenum can be an important aetiological factor in the development of a median diastema. If a labial frenectomy was to be carried out as part of orthodontic treatment, the preferred timing among OS was just before closure of the median diastema (37.0%) while the majority of OMFS felt that timing did not matter (31.7%). More than half (55.7%) of the respondents used the Archer and Kruger classical technique exclusively for frenectomies, and a large majority (94.3%) preferred the use of a scalpel over electrosurgery or lasers.

Conclusions: Considerable variation was found in the diagnostic approach to aberrant frenums and preferred timing of frenectomies among OS and OMFS; however, some consensus was noted in their choice of surgical technique and instrument. Further studies are required to provide more insight on the appropriate indication and timing for labial frenectomies as well as the need for adjunctive orthodontic treatment for the closure of median diastemas following frenectomy procedures.

1 | Introduction

1.1 | Median Diastema

The presence of a median diastema between the maxillary central incisors is a frequent aesthetic concern among patients presenting at orthodontic clinics. These diastemas are a common

physiological feature in the primary and mixed dentition, but typically decrease in size and prevalence following the eruption of the permanent lateral incisors and canines [1]. Despite this trend, not all median diastemas close spontaneously, with Gardiner [2] reporting a prevalence of 7.0% persisting in individuals aged 15 years, supported by similar findings reported by other studies [3–6]. The aetiology of persistent median

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diastemas has been described as multifactorial with several contributing factors: improper axial inclination of the central incisors, dentoalveolar discrepancies, digit-sucking and tongue-thrusting habits, physical impediments due to supernumeraries or midline pathology, dental anomalies such as missing or diminutive teeth and the presence of an abnormal labial frenum [7, 8]. The aetiological contribution of aberrant labial frenums in median diastema formation is controversial in the literature [7, 9–11]. However, a recent cross-sectional study by Ahn et al. [12] found strong consensus among orthodontists in the UK, with 89.5% ($n = 315$) believing that an abnormal labial frenum is an important aetiological factor in the development of a median diastema.

1.2 | Labial Frenectomy

Performing a frenectomy has been recommended to reduce the risk of relapse following median diastema closure [7]. The classical frenectomy technique, introduced by Archer [13] and Kruger [14] in the 1960s, involves complete excision of the frenum, interdental tissues and palatine papilla. This technique has since been adapted with variations such as V–Y plasty, Z-plasty [15] and Miller's technique [16]. More recently, electrocautery [17] and CO₂ [18] and diode [19] lasers have been introduced as alternatives to conventional surgical techniques, potentially reducing the need for anaesthetics and bleeding risks.

1.3 | Aims

The aim of this study was to obtain the perspectives of oral surgeons (OS) and oral and maxillofacial surgeons (OMFS) on labial frenectomies regarding their indication, timing, and preferred surgical techniques.

2 | Materials and Methods

2.1 | Online Questionnaires

The validated questionnaire from the previous study [12] was used with some modifications. The structured electronic questionnaires assessed the demographics of the respondents, their perspectives regarding the aetiological role of aberrant labial frenums in the development of median diastemas, their methods of diagnosing aberrant labial frenums, as well as their preferred timing, surgical techniques and instruments for labial frenectomies. After a pilot study involving 3 oral and maxillofacial surgery consultants and 1 oral surgery consultant, the 20-item questionnaires were finalised and administered online via Microsoft Forms.

2.2 | Distribution of the Questionnaires

The British Association of Oral Surgeons (BAOS) and British Association of Oral and Maxillofacial Surgeons (BAOMS) were requested to distribute the questionnaires to their respective members. The BAOS circulated the questionnaire

via e-mail to 760 members in April 2023, while the BAOMS posted the questionnaire onto their forum to 1198 members in August 2023. To maximise responses, two reminders were sent at 2-week intervals and the questionnaires remained open for 3 weeks after the final reminder. All collected data were securely stored in a password-protected database with encryption.

2.3 | Ethical Considerations and Statement of Consent

The Ethics Committee of the Oxford University Hospital Research & Development team waived the need for ethics approval for the collection, analysis and publication of the anonymised data for this non-interventional study. All participants were provided with a cover letter along with the questionnaire containing an invitation to participate, background and information of the study, anonymisation and confidentiality information and contact details of the members of the research team. By completing the survey, the participants consented to participate in this study.

2.4 | Statistical Analysis

Descriptive statistics (frequencies and percentages) were used to summarise the study sample characteristics and questionnaire responses. Demographic variables such as job role, clinical setting, years of experience and country of practice were cross tabulated with the belief in the role of aberrant labial frenums as an aetiological factor in the formation of median diastemas. Due to the small number of respondents in some groups of demographic variables, responses were grouped as follows:

- Job role: Consultants, specialists, or trainees
- Years of specialist practice: Up to 15years, or 16years or more
- Country of practice: England, or other

Tests of association were carried out using Chi-square and Fisher exact tests. Since multiple tests were performed using the data, a Bonferroni correction was applied. All statistical analyses were performed using R (version 4.3.0; R Foundation for Statistical Computing, Vienna, Austria) with statistical significance at $p \leq 0.05$.

3 | Results

3.1 | Demographics of Respondents

Of a total of 760 OS and 1198 OMFS, 139 OS and 41 OMFS responded to the questionnaire with a response rate of 18.3% and 3.4% respectively (Table 1). Four of the responses from OS were incomplete and thus excluded, leaving a total of 135 responses. The largest proportion of OS were hospital associate specialists ($n = 60$, 44.4%), while the majority of OMFS were hospital consultants ($n = 36$, 87.8%). OS and OMFS had a comparable proportion of respondents who worked in the National Health

TABLE 1 | Demographics and practice characteristics of respondents.

Demographic information	Oral surgeons, N (%) ^a	Oral and Maxillofacial surgeons, N (%) ^b
Job role		
Specialist in practice	26 (19.3)	0 (0)
Specialist in community	2 (1.5)	0 (0)
Postgraduate student	3 (2.2)	2 (4.9)
Hospital associate specialist	60 (44.4)	3 (7.3)
Hospital consultant	35 (25.9)	36 (87.8)
Hospital academic	9 (6.7)	0 (0)
Clinical setting		
National Health Service	65 (48.1)	20 (48.8)
Private	16 (11.9)	1 (2.4)
Both	54 (40.0)	20 (48.8)
Years of specialist practice, year		
< 5	10 (7.4)	0 (0)
6–15	41 (30.4)	10 (24.4)
16–25	35 (25.9)	13 (31.7)
> 25	49 (36.3)	18 (43.9)
Country of practice		
England	105 (78.4)	33 (80.5)
Wales	7 (5.2)	1 (2.4)
Scotland	10 (7.5)	5 (12.2)
Northern Ireland	6 (4.5)	1 (2.4)
Other	6 (4.5)	1 (2.4)

^aTotal number of oral surgeons, N = 135.

^bTotal number of oral and maxillofacial surgeons, N = 41.

Service (NHS) only (OS: $n = 65$, 48.1%; OMFS: $n = 20$, 48.8%) and a smaller proportion of OS who worked in both the NHS and private sector compared with OMFS (OS: $n = 54$, 40.0%; OMFS: $n = 20$, 48.8%). Only a small percentage worked solely in the private sector (OS: $n = 16$, 11.9%; OMFS, $n = 1$, 2.4%). The largest proportion of each group (OS: $n = 49$, 36.3%; OMFS: $n = 18$, 43.9%) had more than 25 years of experience. Most respondents were based in England ($n = 138$, 78.4%).

3.2 | Aberrant Labial Frenums

One-hundred and fourteen OS (84.4%) believed that a low and hypertrophic labial frenum can be an important aetiological factor in the development of a median diastema. This was a larger

proportion compared to 28 OMFS (68.3%) who shared this belief. There was no statistically significant association between this belief and job role (OS: $\chi^2 = 1.129$, $p = 0.569$; OMFS: $\chi^2 = 2.644$, $p = 0.267$); clinical setting (OS: $\chi^2 = 5.728$, $p = 0.057$; OMFS: $\chi^2 = 3.362$, $p = 0.186$); country of practice (OS: $\chi^2 = 0.000$, $p = 1.00$; OMFS: $\chi^2 = 0.666$, $p = 0.415$); and years of specialist practice (OS: $\chi^2 = 0.045$, $p = 0.832$; OMFS: $\chi^2 = 0.041$, $p = 0.980$).

Seventy-eight OS (57.8%) and 21 OMFS (51.2%) routinely carried out a blanche test to diagnose an aberrant labial frenum. Twenty-two OS (16.3%) and 8 OMFS (19.5%) routinely ordered maxillary anterior occlusal radiographs to assess for midline clefts in the maxillary suture. Of these respondents, 13 OS (59.1%) and 6 OMFS (75.0%) believed that the radiographic findings influenced their diagnosis and clinical decision.

3.3 | Timing of Labial Frenectomy

When asked about their preferred timing to perform a frenectomy without orthodontic treatment, 79 OS (58.5%) responded that they would not consider frenectomy without orthodontic treatment, while most of the remaining OS were divided between carrying out a frenectomy after canine eruption ($n = 21$, 15.6%) or at the time of diagnosis ($n = 20$, 14.8%) (Figure 1). Similarly, 33 OMFS (80.5%) would not consider frenectomy without orthodontic treatment. The remaining 8 OMFS were divided between performing the frenectomy before canine eruption ($n = 3$, 7.3%), after canine eruption ($n = 3$, 7.3%) or at the time of diagnosis ($n = 2$, 4.9%).

If the labial frenectomy was to be carried out as part of orthodontic treatment, the preferred timing for the frenectomy was largely varied for both OS and OMFS (Figure 2). The most favoured timing among OS was just before closure of the median diastema ($n = 50$, 37.0%), while the majority of OMFS felt that timing did not matter ($n = 13$, 31.7%). More than 50% of OS and OMFS routinely sought an orthodontic opinion before performing a labial frenectomy (OS: $n = 79$, 58.5%; OMFS: $n = 21$, 51.2%). Twenty-six OS (19.3%) and 13 OMFS (31.7%) would only seek an orthodontic opinion sometimes, while 28 OS (20.7%) and 6 OMFS (14.6%) did not seek an orthodontic opinion (Figure 3). Among the latter group, difficulty in accessing an orthodontic opinion was not a factor for this decision for 25 OS (89.3%) and 4 OMFS (66.7%).

3.4 | Choice of Anaesthetic

A large proportion of OS ($n = 103$, 76.3%) and OMFS ($n = 31$, 75.6%) performed approximately 1–10 frenectomies annually. Local anaesthetic (LA) was the most frequently selected choice of anaesthetic in both groups, with almost all OS ($n = 134$, 99.3%) and the majority of OMFS ($n = 34$, 82.9%) indicating LA as one of their routine anaesthetics used for frenectomies (Table 2). Among OS, 76 (56.3%) reported using LA exclusively, compared with 16 OMFS (39.0%). A further 26 OS (19.3%) indicated that they would consider either LA or topical anaesthetic, while 16 OMFS (39.0%) reported using either LA or GA. Patient compliance was the key factor for

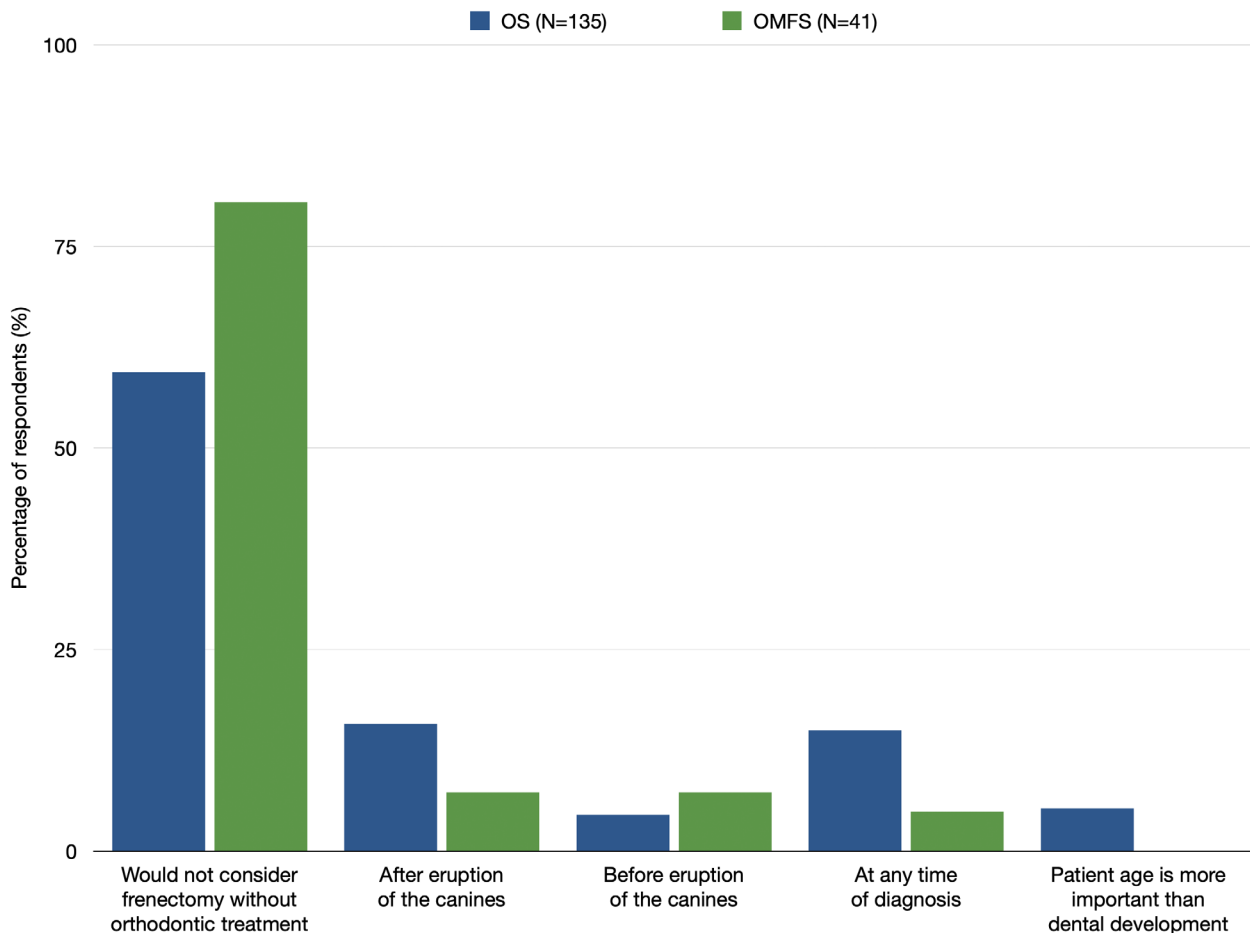


FIGURE 1 | Respondents' preferred timing for frenectomies if carried out without orthodontic treatment.

both OS ($n = 62, 45.9\%$) and OMFS ($n = 22, 53.7\%$) when deciding which anaesthetic to use, followed by familiarity with the anaesthetic.

3.5 | Surgical Technique and Instrument

The most favoured surgical technique was the Archer and Kruger classical technique for both OS ($n = 76, 56.3\%$) and OMFS ($n = 22, 53.7\%$) (Table 3). The second most performed technique was the V-Y plasty (OS: $n = 37, 27.4\%$; OMFS: $n = 8, 19.5\%$). The remaining respondents used either the classical technique, V-Y plasty, or Z-plasty techniques. None of the respondents used Miller's technique. The majority of OS ($n = 127, 91.4\%$) and OMFS ($n = 39, 95.1\%$) used scalpels as their main surgical instrument for frenectomies. Among OS, 3 (2.2%) used lasers, 2 (1.5%) used both scalpels and lasers, while 2 (1.5%) used electrosurgery for frenectomies. None of the OMFS used lasers or electrosurgery.

3.6 | National Protocol

Varied responses were received on whether having a National Protocol or Guideline would influence their practice. Sixty-two OS (45.9%) and 20 OMFS (48.8%) agreed that it would change

their practice, while 15 OS (11.1%) and 8 OMFS (19.5%) felt that it would not. The remaining respondents were undecided.

4 | Discussion

4.1 | Aetiological Role of Aberrant Labial Frenums

The majority of OS agree that aberrant labial frenums play an aetiological role in the development of median diastemas, consistent with findings reported among orthodontists [12]. However, less consensus was found among OMFS, with approximately one-third believing that the aberrant frenum did not play a significant role in median diastema formation. The Australian Collaboration for Infant Oral Research [20] and the American Academy of Otolaryngology–Head and Neck Surgery [21] have released consensus statements that no intervention is recommended for prominent maxillary midline frenums in infancy as it is not predictive of future median diastema formation. This stance towards labial frenectomies among medical professionals could explain the difference in opinion of OMFS from that of orthodontists and OS.

Of perhaps greater clinical significance would be the question of whether frenectomy of the aberrant labial frenum would help to reduce the risk of relapse following orthodontic space closure. Edwards [7] found a strong correlation between aberrant

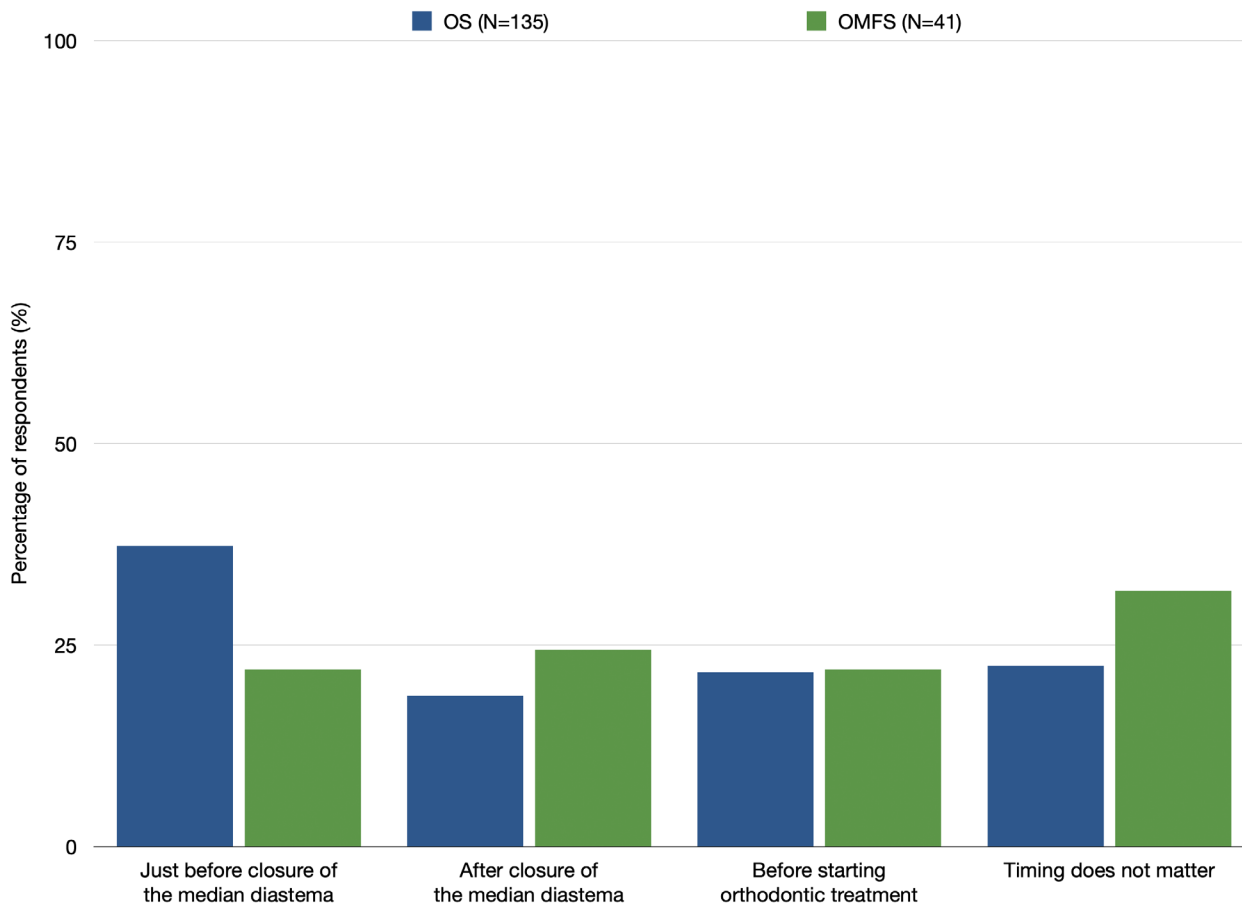


FIGURE 2 | Respondents' preferred timing for frenectomies if carried out as part of orthodontic treatment.

frenums and the relapse potential of median diastemas, as well as a dramatic reduction in relapse following excision of such aberrant frenums. Taylor [5], conversely, deemed frenectomies unnecessary as he found that pressure atrophy produced by orthodontic space closure eliminated the abnormal frenum naturally.

4.2 | Diagnosis of Aberrant Labial Frenums

Diagnostic tests such as a blanche test and radiographic assessment of the midline bony cleft have been suggested to aid in identifying aberrant labial frenums [22, 23]. The proportion of OS and OMFS who routinely performed the blanche test was lower than previously reported among orthodontists [12]. A possible reason for this discrepancy could be that most frenectomy cases seen by surgeons are referred by other clinicians. Since the aberrant frenum had already been diagnosed by the referring clinician, surgeons may find that performing these tests will not influence their clinical decision. The 'Policy on Management of the Frenulum in Pediatric Patients' by the American Academy of Paediatric Dentistry [24] advises treatment of the aberrant frenum when there is a positive blanche test or if the frenum has caused a diastema wider than 2mm which is unlikely to close spontaneously. The proportion of OS and OMFS who routinely obtained diagnostic radiographs for aberrant labial frenums was low, mirroring findings reported among orthodontists [12]. Although studies have found a significant correlation between a

midline cleft in the alveolus and relapse potential of the median diastema [7, 25], there are currently no guidelines advising the use of intraoral radiographs in diagnosing aberrant frenums.

Consistent with findings among orthodontists [12], the majority of OMFS indicated that they would not consider frenectomy without orthodontic treatment, whereas this view was less commonly held among OS. This difference in opinion could explain why almost half of the respondents did not routinely seek an orthodontic opinion for their frenectomy cases. The American Academy of Pediatric Dentistry [24] recommends that a frenectomy should only be performed after the permanent canines erupt and in conjunction with orthodontic treatment. Nevertheless, isolated case reports have described spontaneous closure of median diastemas following frenectomy performed during the early mixed dentition without adjunctive orthodontic therapy, with stability observed at long-term follow-up [26]. Further high-quality studies are required to determine the predictability of such outcomes.

While orthodontists most commonly favour performing frenectomy after diastema closure [12], OS and OMFS in the present study demonstrated greater variation in their preferred timing and in the perceived importance of timing. Several authors have recommended performing frenectomies after closure of the median diastema to allow healing of the tissues with the teeth in their newly established positions and to improve the stability of the space closure [11, 16, 22]. Performing the frenectomy prior

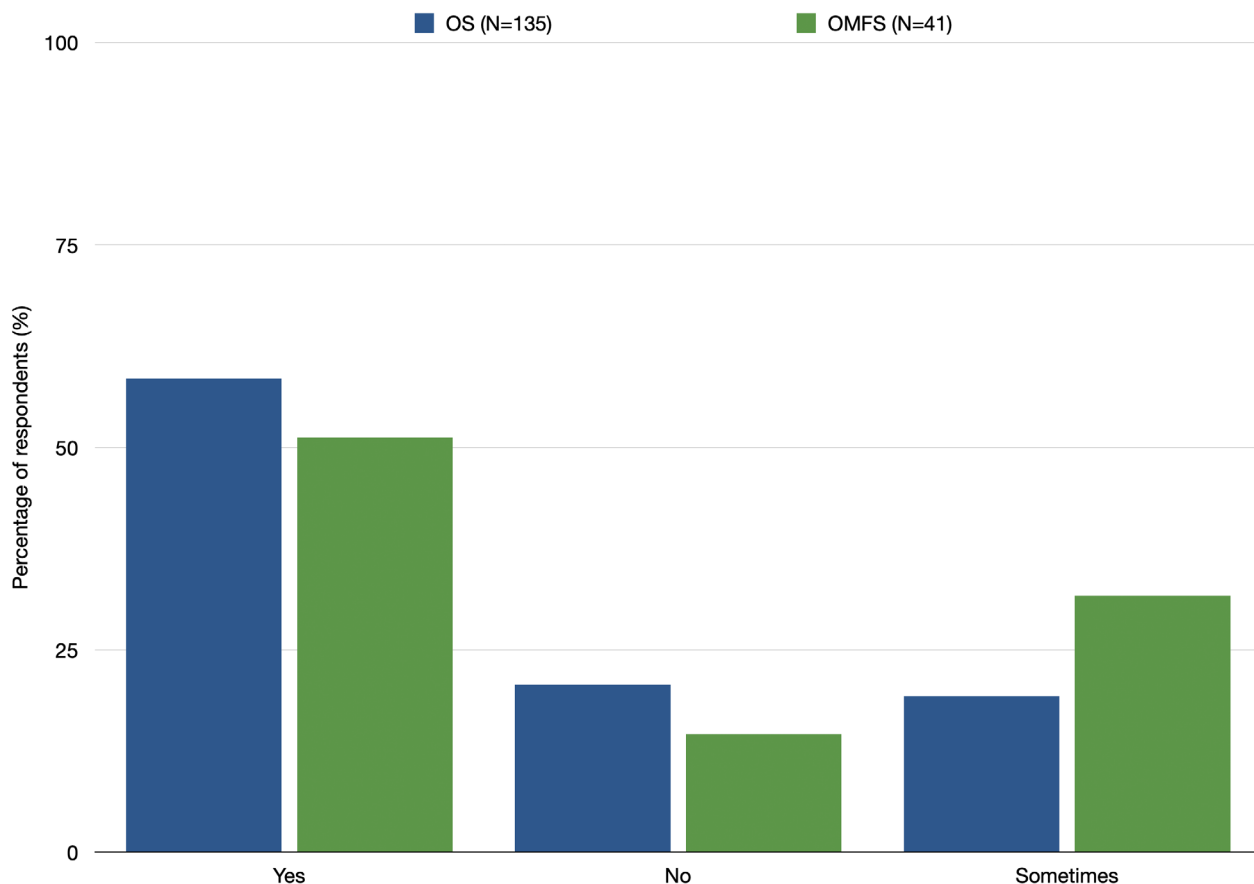


FIGURE 3 | Respondents' opinion on seeking an orthodontic opinion before performing a frenectomy.

TABLE 2 | Choice of anaesthetic for frenectomies.

	OS, N (%)	OMFS, N (%)
Local anaesthetic	134 (99.3%)	34 (82.9%)
General anaesthetic	25 (18.5%)	21 (51.2%)
IV sedation	12 (8.9%)	1 (2.4%)
Topical anaesthetic	30 (22.2%)	1 (2.4%)
None	0 (0%)	4 (9.8%)

Note: Respondents were permitted to select more than one option; therefore, total percentages exceed 100%.

TABLE 3 | Choice of surgical technique for frenectomies.

Choice of surgical technique	OS, N (%)	OMFS, N (%)
Archer–Kruger classical technique	88 (65.2%)	27 (65.9%)
V–Y plasty	49 (36.3%)	13 (31.7%)
Z-plasty	7 (5.2%)	4 (9.8%)
Electrosurgery	1 (0.7%)	0 (0%)
Miller's technique	0 (0%)	0 (0%)

Note: Respondents were permitted to select more than one option; therefore, total percentages exceed 100%.

to space closure has also been advocated when the aberrant frenum is thick and bulky and may cause discomfort during space closure [27].

4.3 | Choice of Anaesthetic

A large majority of OS and OMFS in this study use LA routinely for frenectomy procedures, differing from a UK-based audit in 2014 [27] which found that 29 out of 41 patients had frenectomies performed under GA. Although there are no guidelines on the appropriate choice of anaesthetic, frenectomy procedures can be carried out safely under LA and thus, the use of LA has been encouraged over GA to reduce risks associated with GA [27].

4.4 | Surgical Technique and Instrument

The Archer and Kruger classical technique was the preferred frenectomy technique among surgeons. This technique is an excisional frenectomy that aims to excise muscle fibres supposedly connecting the orbicularis oris with the palatine papilla [13, 14, 16]. The application of plastic surgery techniques resulted in variations such as the V–Y plasty and Z-plasty techniques. The V–Y plasty was the next preferred technique in this study, indicated for elongation of the frenal attachment to improve aesthetics and reduce scar tissue formation [28]. Similarly, the Z-plasty technique involves repositioning of the aberrant frenum through the transposition of two triangular

flaps, thus reducing the possibility of hypertrophic scar formation. However, only a small proportion of respondents perform the Z-plasty technique. Finally, Miller's technique [16] involves a laterally positioned pedicle graft to allow formation of a contiguous collagenous band of gingiva across the midline rather than scar tissue to preserve the interdental papillae. Currently, none of the respondents have reported the use of Miller's technique.

The scalpel was the preferred surgical instrument for almost all OS and OMFS, with minimal reported use of electrocautery and lasers. A similar trend was observed in a US survey-based study [29] with the majority of OMFS preferring the use of scalpels or scissors. This preference may reflect greater familiarity with scalpel-based techniques acquired during surgical training and routine clinical practice, as well as the equipment and certification costs associated with laser and electrocautery devices. Given that a substantial proportion of respondents had more than 25 years of clinical experience, variations in exposure to laser technology during training may also have influenced the observed trends in clinical practice. Nevertheless, CO₂ and diode lasers have been used for soft tissue procedures in the oral cavity since the 1980s [18], with reported benefits including reduced need for anaesthetics and suturing, less intra-operative bleeding and postoperative pain [19, 30, 31]. Electrocautery similarly offers reduced bleeding risk and postoperative complications, although it carries other risks such as burns and the production of surgical smoke [17]. Despite these potential benefits, only a small proportion of OS and none of the OMFS in the present study reported using lasers and electrocautery. Interestingly, the US survey [29] found a greater preference for lasers when the frenectomy was performed by orthodontists or paediatric dentists. Greater integration of laser training during surgical residency and continuing professional development may support broader familiarity with their use as an adjunct to conventional scalpel techniques where clinically appropriate.

4.5 | Strength and Limitations

To the authors' knowledge, this is the first survey to examine current clinical practices relating to labial frenectomies among OS and OMFS in the UK. The findings offer valuable insight into contemporary practice and perspectives, including views on the need for clinical guidelines.

However, there are some limitations to consider when interpreting the findings of this study. The questionnaire was adapted from the questionnaire used in the previous study conducted among orthodontists [12] to facilitate comparison between specialties. Although the questionnaire was piloted with a small group of clinicians prior to distribution, formal assessment of reliability and validity was not undertaken. As such, the potential for bias should be acknowledged.

Furthermore, despite the use of reminders which have been reported to increase response rates [32], the overall response rate remained low for both OS and OMFS. The distribution method may have contributed to this, as the survey was disseminated electronically via e-mail for OS and through a forum post for OMFS. Low response rates are a recognised challenge in questionnaire-based research, particularly with online distribution. The relatively low response rate in this study may limit the

generalisability of the findings, as the views captured may not be fully representative of the wider population of OS and OMFS. Statistical tests of association between OS and OMFS were not undertaken, given the potential for response bias to influence the observed differences. Future studies involving randomly selected samples of OS and OMFS would be better positioned to determine whether a true difference in clinical practice exists between the specialties.

5 | Conclusion

- Considerable variation exists between OS and OMFS in the UK with regards to diagnosis of aberrant labial frenums, timing of frenectomies as well as the need for orthodontic treatment in conjunction with frenectomies for space closure of median diastemas.
- The Archer and Kruger classical technique was the preferred frenectomy method and the scalpel was the most commonly used surgical instrument for labial frenectomies among OS and OMFS.
- Further high-quality studies are needed to provide more insight on the appropriate indication and timing for labial frenectomies as well as the need for orthodontic treatment for the closure of median diastemas following frenectomy procedures.

Author Contributions

Dawn Anne Yip Xinying: data curation, formal analysis, writing – original draft, writing – review and editing. Caroline Marron: conceptualisation, methodology, data acquisition, project administration, supervision, writing – review and editing. Adam Hasan: data curation, formal analysis, supervision, writing – review and editing. John Hyunbaek Ahn: conceptualisation, methodology, data acquisition, data curation, formal analysis, project administration, supervision, writing – review and editing.

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The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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