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Knowledge, Attitudes, and Practices of Moroccan Orthodontists regarding the Surgery-First Approach

Zineb Idrissi Kaitouni[1], Meryem Lahlou[1], Amina El Khadali[1], Hicham El Bouri[2], Farid Bourzgui[3], Meriem Bellamine[1], Ihsane Ben Yahya[1]

[1]Mohammed VI Faculty of Dentistry, Mohammed VI University of Sciences and Health, Casablanca, Morocco
[2]Faculty of Medicine and Pharmacy, Abdelmalek Essaâdi University, Tangier, Morocco
[3]Faculty of Dentistry, Hassan II University, Casablanca, Morocco
Email: zidrissikaitouni@um6ss.ma

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Abstract

This study aims to assess the knowledge of Moroccan orthodontists regarding the Surgery First Approach (SFA) in the management of dentofacial deformities, and to compare it with the conventional approach. It also seeks to confront the clinical indications reported in the Moroccan context with those described in the international literature, and to analyze practitioners' perceptions of the advantages and limitations of this approach. A cross-sectional descriptive study was conducted among a sample of Moroccan orthodontists using an online questionnaire. The survey focused on their knowledge, attitudes, and practices concerning the SFA, as well as their perception of the conventional approach. The questionnaire was distributed to 110 practitioners, and 97 complete responses were collected. Among the orthodontists surveyed, 56.7% reported being well-informed about the SFA, but 68.4% had never applied it in practice. The most frequently reported indications were skeletal Class III (77.1%), facial asymmetry (65.1%), Class II deformities (62.7%), and anterior vertical excess (55.4%). Perceived benefits included immediate functional and aesthetic improvement (85.5%) and reduced overall treatment time (54.2%). The main limitations identified were challenges in postoperative follow-up and occlusal stability. Most respondents (76%) reported being satisfied with the outcomes of the SFA, and 84% believed their patients were as well. A majority (64.9%) felt that this approach should remain limited to carefully selected cases. Despite a generally favorable perception, the SFA remains underutilized in clinical practice. Better dissemination of protocols and enhanced continuing education could support its broader integration into routine orthodontic care.

Subject Areas

Dentistry

Keywords

Orthognathic Surgery, Orthodontics, Surgery First, Dentofacial Deformities

1. Introduction

Dento-maxillofacial deformities represent a major concern in contemporary orthodontics due to their increasing prevalence [1] and their aesthetic, functional, and psychosocial repercussions. These anomalies can negatively affect patients' quality of life by impairing mastication, speech, facial harmony, and self-image [2] [3]. Two main forms are generally distinguished: dentoalveolar deformities, which are often moderate and treated with orthodontics alone; and severe skeletal deformities, which require combined surgical and orthodontic management [4] [5].

Historically, in the 1950s and 1960s, the management of severe malocclusions was based on a direct surgical approach without prior orthodontic preparation. This strategy, comparable to what is now referred to as the surgery-first approach (SFA), was applied regardless of the type of malocclusion or the severity of dentoalveolar compensations [6]. However, the lack of preparation limited functional and occlusal outcomes, often resulting in postoperative instability [7].

In response to these limitations, a paradigm shift occurred in the 1970s. Authors such as Converse and Horowitz (1969) [8], followed by Worms *et al.* (1976) [9], emphasized the necessity of prior orthodontic alignment to ensure surgical stability. This new model, largely influenced by Obwegeser, led to the development of the conventional or orthodontics-first approach [8] [10]. It is based on a standardized sequence [11]:

- A presurgical orthodontic phase (lasting 12 to 24 months), aimed at eliminating dentoalveolar compensations and aligning the arches;
- An orthognathic surgery phase adapted to the type of deformity (mono- or bimaxillary);
- A postsurgical orthodontic phase to finalize occlusion and ensure stability [12].

Although effective, this conventional approach presents several drawbacks. The overall treatment duration—ranging from 7 to 47 months—exposes patients to various risks, including dental caries, root resorptions, gingival recessions, prolonged masticatory discomfort, altered facial aesthetics during orthodontic decompensation, and significant psychological distress [12] [13].

In this context, a return to the initial approach, now formalized under the name surgery-first, has re-emerged in recent decades. Revisited and conceptualized by Behrman and LeGall in 1988, this strategy consists of performing orthognathic surgery first, without prior orthodontic preparation, followed by postoperative orthodontic treatment [14] [15]. One of its key foundations is the Regional Acceleratory Phenom-

enon (RAP), which facilitates faster tooth movement after surgery [16], significantly reducing overall treatment time while providing immediate aesthetic benefit [17].

This approach thus presents several advantages, including shorter treatment duration, improved protocol acceptability, and rapid patient satisfaction. However, it remains technically demanding, requires meticulous planning, a precise anticipation of the final occlusion, and a rigorous selection of eligible cases.

Although the surgery-first strategy is gaining growing interest in international literature due to its clinical and aesthetic benefits, its level of adoption in the daily practice of Moroccan dental surgeons remains unknown. To date, no study has explored their level of knowledge, attitudes, or patterns of use of this approach in managing dentoskeletal deformities.

This study aims to address the lack of data on the adoption of the SFA in Morocco. Its outcomes are expected to support clinical decision-making, identify barriers to its implementation, and inform the development of targeted continuing education programs in integrated orthodontic-surgical management.

In this context, the study investigates the level of knowledge, attitudes, and clinical practices of Moroccan orthodontists regarding the SFA in managing dentofacial deformities. The underlying hypothesis is that, despite growing international acceptance, this strategy remains underutilized in Morocco due to technical challenges, limited training, and complex treatment planning.

2. Materials and Methods

2.1. Study Design and Setting

This was a cross-sectional, descriptive, observational study conducted over a one-month period starting in January 2025. The survey targeted orthodontic practitioners across Morocco.

2.2. Sample Description

A non-probability convenience sampling method was used, selecting accessible and voluntary participants.

Recruitment was carried out through a private WhatsApp group comprising 110 Moroccan orthodontists, whose profiles already matched the study's inclusion criteria, thus naturally preselecting the target population.

An electronic invitation containing a link to the questionnaire was distributed within the group.

2.2.1. Inclusion Criteria

Orthodontists were eligible to participate if they were certified dental surgeons specialized in orthodontics (trained in Morocco or abroad), currently practicing in Morocco (private, public, or university hospital), and had experience with combined orthodontic–surgical cases, either through direct clinical management or professional exposure via collaboration with surgeons, academic supervision, or postgraduate training. Participants had to provide informed consent, ensuring anonymity and data confidentiality.

2.2.2. Exclusion Criteria

Orthodontists practicing outside Morocco or dentists not actively involved in orthodontic practice were excluded.

2.3. Data Collection Tools

Data were collected using an online questionnaire created with Google Forms and distributed via the WhatsApp group for Moroccan orthodontists.

The questionnaire was developed based on a review of the scientific literature, drawing inspiration from similar studies addressing knowledge, attitudes, and clinical practices in orthodontic surgery, particularly regarding the surgery-first approach.

Survey Description

The survey comprised 18 items, including both open- and closed-ended questions (single or multiple choice), organized into two sections. The first section collected socio-professional data such as age, gender, training, practice setting, and geographic location. The second section assessed knowledge and clinical experience regarding the surgical management of dentofacial deformities, covering conventional approaches and the surgery-first strategy, including awareness, usage, satisfaction, and perceived patient outcomes. An introductory statement detailed the study objectives, potential implications, and guaranteed anonymity, confidentiality, and voluntary participation. The questionnaire was developed after an extensive literature review and pilot-tested among final-year orthodontic residents to ensure clarity and content validity, resulting in minor revisions. Internal consistency was assessed only for the attitudinal subscale, yielding a Cronbach's alpha of 0.78, indicating good reliability.

2.4. Data Entry and Analysis

Data were entered and analyzed using Epi Info software, version 7.0. As the variables were primarily qualitative, results were expressed in frequencies and percentages, with corresponding 95% confidence intervals (CI).

2.5. Ethical Considerations

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and best practices in health research. It was approved by the Ethics Committee of Mohammed VI University of Health Sciences (approval number: CE/UM6SS/52/25).

The questionnaire's introduction clearly stated the study's purpose, its objectives, and guarantees regarding anonymity and data confidentiality. No material incentives or compensation were offered in exchange for participation.

3. Results

Out of 110 distributed questionnaires, 97 were completed, yielding a response rate of 88.2%. Among respondents, 59.8% were aged between 30 and 49 years, 53.6%

were female, and 72.2% had more than 5 years of professional experience. Over half (51.2%) practiced in the private sector (Table 1).

Table 1. Socio-professional characteristics of participants.

Variable	Frequency	Percentage (%)
Age (n = 97)		
Under 30 years	17	17.5
30 - 39 years	29	29.9
40 - 49 years	29	29.9
50 years and older	22	22.7
Sex (n = 97)		
Male	45	46.4
Female	52	53.6
Years of experience (n = 97)		
Less than 5 years	27	27.8
5 - 10 years	12	12.4
10 - 20 years	31	32.0
More than 20 years	27	27.8
Practice setting (n = 96)		
Private practice	50	52.1
University hospital	29	30.2
Mixed	17	17.7

The majority of orthodontists (70.1%) reported having already managed dentofacial deformities in collaboration with maxillofacial surgeons. In this context, 55.9% of practitioners treated fewer than five patients per year.

Regarding the surgery-first approach, 56.7% reported being well informed, while 13.4% with no knowledge of the approach were asked to discontinue the survey (Table 2).

Table 2. Experience with orthognathic surgery and knowledge of the surgery-first approach.

Variable	Frequency	Percentage (%)
Experience with orthognathic surgery (n = 97)		
Has managed surgical cases	68	70.1
Has never managed surgical cases	29	29.9

Continued

Frequency of use of orthognathic surgery (n = 68)		
Rarely	38	55.9
Occasionally	24	35.3
Regularly	4	5.9
Frequently	2	2.9
Familiarity with the surgery-first (n = 97)		
Yes	55	56.7
Partially	29	29.9
No	13	13.4

Among the surveyed orthodontists, 68.4% reported never having used the surgery-first approach for the treatment of dentofacial deformities. Among those who had, 92% treated fewer than five cases per year, primarily for skeletal Class III malocclusions (68%), followed by Class II (48%) and facial asymmetries (28%).

The main indications for the surgery-first approach were skeletal Class III malocclusions (77.1%), followed by facial asymmetries (65.1%), skeletal Class II malocclusions (62.7%), and anterior vertical excess (55.4%) (Table 3).

Table 3. Orthodontists' experience with the surgery-first approach.

Variable	Frequency	Percentage (%)
Experience with surgery-first approach (n = 79)		
Has used surgery-first	25	31.6
Has never used surgery-first	54	68.4
Number of cases per year (n = 25)		
Rarely	23	92.0
Occasionally	1	4.0
Regularly	1	4.0
Types of deformities treated (n = 25)		
Class III	17	68.0
Class II	12	48.0
Facial asymmetry	7	28.0
Anterior vertical excess	5	20.0
Open bite	4	16.0

Continued

Perceived main indications (n = 83)		
Class III	64	77.1
Facial asymmetry	54	65.1
Class II	52	62.7
Anterior vertical excess	46	55.4
Open bite	36	43.4
Others	3	3.6

According to participants, the main perceived benefits of the SFA were rapid improvement in facial aesthetics (85.5%), reduced overall treatment duration (54.2%), and greater patient acceptance (41%).

Reported limitations included difficulty in maintaining follow-up after surgery (50.6%), challenges in predicting final occlusion (49.4%), and lack of a stable occlusion at the time of surgery (48.2%) (Table 4).

Table 4. Perception of the surgery-first approach.

Variable	Frequency	Percentage (%)
Perceived advantages (n = 83)		
Immediate aesthetic and functional gain	71	85.5
Shorter overall treatment time	45	54.2
Better patient acceptance	34	41.0
Faster tooth movement postoperatively	32	38.6
Other	1	1.2
Perceived disadvantages (n = 83)		
Loss of patient follow-up	42	50.6
Difficulty in predicting final occlusion	41	49.4
No stable occlusion at time of surgery	40	48.2
Risk of occlusal instability postoperatively	39	47.0
Increased number of postoperative appointments	17	20.5
Higher relapse rate	9	10.8
Other	1	1.2

Overall, 76% of orthodontists expressed satisfaction with the outcomes of surgery-first treatments.

Most practitioners (84%) also perceived their patients as being satisfied, with

facial changes identified as the main contributing factor by 61.5% of respondents. Looking ahead, 64.9% believed that the SFA should be applied selectively, in carefully chosen cases (Table 5).

Table 5. Satisfaction and future perception of the surgery-first approach.

Variable	Frequency	Percentage (%)
Practitioner satisfaction (n = 25)		
Satisfied	19	76.0
Moderately satisfied	4	16.0
Unsatisfied	2	8.0
Patient satisfaction (n = 25)		
Satisfied	21	84.0
Moderately satisfied	3	12.0
Unsatisfied	1	4.0
Main determinant of patient satisfaction (n = 65)		
Facial changes	40	61.5
Both facial and dental changes	25	38.5
Dental changes only	0	0.0
Future use of surgery-first (n = 77)		
Yes, certainly	19	24.7
Yes, in selected cases	50	64.9
No, prefer conventional approach	8	10.4

4. Discussion

Orthognathic surgery in the treatment of dentoskeletal dysmorphisms is undergoing a significant shift. The traditional paradigm of "orthodontics first" is giving way to a reversed approach, previously overlooked. This renewal, driven by technological advances, may immediately improve facial aesthetics—thus targeting the patient's primary consultation motive [18]—and could potentially shorten treatment duration [16].

This study explores the extent to which Moroccan orthodontists align with this trend by evaluating their knowledge level, attitudes, and practices concerning surgery-first (SF) in managing dentoskeletal dysmorphoses.

Overall, practitioners in our sample demonstrate a solid theoretical foundation regarding the SFA. However, this conceptual mastery contrasts sharply with participants' clinical practice. While over half of the surveyed practitioners declare themselves well informed about this approach, only one-third have actually applied it. This low adoption rate reflects situations observed elsewhere, notably in

India (2020) [19], where usage rates reach 16%. Furthermore, Barone *et al.* (2020) [20] and Zheng *et al.* (2023) [21] attribute this limited adoption to resistance to change linked to habits formed during training, lack of continuing education, and organizational obstacles.

This reluctance in practice is also explained by the stringent clinical requirements associated with this approach. Indeed, despite initial enthusiasm for the SFA, a retrospective study conducted in 2022 by Hernández-Alfaro *et al.* over more than ten years reports that inclusion criteria for SF candidates have not been broadened but rather tightened. This restriction limits SF application to rigorously selected cases, as reflected in their SF/conventional surgery ratio, where SF represents only 9.2% of all orthognathic procedures [22].

In this context, the ability of practitioners in our study to formulate indications for surgery-first consistent with the literature supports their positive perception of their knowledge. Dysmorphoses treated by SF in our sample mainly involve skeletal Class II (48%) and Class III (62.7%) cases, corresponding to the most frequently reported indications. These observations align with the findings of Damiano *et al.* (2023) [8] and Gandedkar *et al.* (2016) [23], who identify Class III as the preferred indication due to its rapid aesthetic benefits and overall treatment shortening.

However, this expertise appears less certain in complex clinical situations such as cleft lip and palate, for which SF indications remain controversial. In our survey, only 4% of practitioners reported having used SF to treat these dysmorphoses. While this low frequency could initially be interpreted as a lack of specific training or limited access to qualified multidisciplinary teams, it may also reflect justified caution given ongoing debate in the literature.

This controversy is clearly evident in the literature, where divergent positions coexist: on one hand, Liao *et al.* (2024) [24] report promising results in rigorously selected cases, highlighting the potential benefits of SF; on the other hand, Jong-Woo Choi *et al.* [25] adopt a more restrictive stance, arguing that dysmorphoses associated with cleft lip and palate do not justify SF use. These patients generally receive orthodontic follow-up from childhood, allowing progressive presurgical orthodontic treatment to be better adapted to their complex situation.

Similarly, facial asymmetries pose a particular therapeutic challenge. In our sample, only 28% of orthodontists reported having resorted to SF in this context. Yet studies such as that of Choi *et al.* (2021) [26], comparing the reliability of SF versus conventional approaches in managing facial asymmetries, underscore its growing interest.

In these cases, SF allows immediate correction of skeletal imbalance while promoting faster functional adaptation due to the absence of prior orthodontic decompensation.

Thus, Moroccan orthodontists' attitudes may not reflect a lack of knowledge or experience but rather clinical caution toward an indication still debated and requiring highly specific management conditions.

Extending this analysis, we also explored the criteria for selecting patients for SF. Our survey reveals that the importance of anteroposterior discrepancy (72.3%), transverse discrepancy (68.7%), and patient motivation (59%) are the most frequently considered factors, emphasizing the severity of skeletal imbalance and active patient engagement. Additional specific elements identified in the literature, notably in a 2020 study [27], include anterior teeth inclination, the Curve of Spee, and transverse deficits. This study emphasizes the necessity of stable occlusion before intervention as a critical factor to ensure optimal occlusal function and minimize postoperative orthodontic adjustments.

Although SF indication remains reserved for rigorously selected cases, its adoption is widely motivated by the perceived advantages. In our survey, a significant majority of practitioners (85.5%) identify immediate aesthetic and functional improvement as the main benefit. This perception aligns with Zheng *et al.*'s (2023) [21] meta-analysis, showing that early correction of facial anomalies markedly improves patients' psychological well-being by alleviating emotional stress and social discomfort related to the presurgical orthodontic decompensation phase. Thus, the SFA offers visible improvement from the beginning of treatment.

Moreover, over half of the orthodontists surveyed (54.2%) believe this approach reduces overall treatment time. These results align with those of Sandra Sagara's (2020) [19] survey, where 39% of orthodontists estimated SF reduces treatment duration to approximately 12 - 18 months. This reduction is mainly attributed to the regional acceleratory phenomenon (RAP) post-surgery, which temporarily increases cellular activity and bone remodeling, as well as the elimination of the presurgical orthodontic preparation phase [16].

Furthermore, nearly 38.6% of orthodontists observed accelerated postoperative tooth movement. This phenomenon is explained not only by RAP but also by synergy between orthodontic forces and functional adaptation of soft tissues (lips, tongue), facilitating faster and better-directed tooth displacement [28].

Additionally, 41% of practitioners report better patient acceptance of treatment. This observation is corroborated by the literature, which emphasizes that immediate improvement in facial profile fosters a more positive treatment perception and strengthens therapeutic engagement [29].

While all these advantages encourage many practitioners to adopt SF, they face limitations that should not be overlooked. In our survey, the main disadvantage reported by 50.6% of orthodontists is loss of patient follow-up after surgery, possibly linked to immediate aesthetic improvement, which may reduce their motivation to continue postoperative orthodontic treatment. Moreover, 49.4% highlight that absence of prior orthodontic preparation complicates prediction of the final occlusion—a major challenge confirmed by Sandra Sagar (2020) [19], whose study shows 78% of orthodontists consider lack of stable preoperative occlusion the main difficulty. This uncertainty results in a risk of postoperative occlusal instability, reported by 47% of respondents and also noted by Sagar (2020) [19]. Furthermore, increased number of postoperative visits was noted by 20.5% of or-

thodontists.

Beyond these considerations, one issue crystallizes practitioners' concerns: postoperative relapse. A true challenge in clinical practice remains the main source of worry among orthodontists. Recent scientific work provides a more nuanced appreciation of postoperative stability in SF. The systematic review by Soverina *et al.* (2019) [29] concludes that relapse frequency is comparable to that observed with conventional management, provided orthodontic care is rigorous. Several studies highlight the influence of multiple parameters on long-term stability, including the method of bone segment fixation, quality of adaptation, healing, occlusal topography (Curve of Spee, overjet, overbite), and condylar position [30]. Better stability seems observed in patients with a flat Curve of Spee and reduced overbite [31] [32]. Overall, most available data tends to confirm equivalent skeletal stability between the two protocols [33]. A notable exception is the meta-analysis by Wei *et al.* (2018) [34], suggesting a higher mandibular relapse rate in patients treated by SF.

Besides stability issues, practitioner satisfaction is a key indicator of growing acceptability of SF. In our survey, 76% of orthodontists declared satisfaction with obtained results, 16% were moderately satisfied, and 8% dissatisfied. These data reflect increasing expertise development for this approach within the Moroccan orthodontic community.

Internationally, the study by Damiano *et al.* (2023) [8] reveals high satisfaction levels, mainly attributed to the aforementioned benefits such as immediate functional and aesthetic improvement and reduced overall treatment time.

Since practitioner satisfaction inevitably involves patient satisfaction, 84% of respondents stated their patients were satisfied, especially due to early aesthetic benefits. These data are confirmed by a recent systematic review by B. Vande Vannet *et al.* (2023)

[35] reporting that patients treated by SF presented significantly lower OHIP-14 scores as early as the first treatment month. This rapid quality-of-life improvement is explained by immediate malocclusion correction and facial profile harmonization after surgery. In contrast, patients treated conventionally showed decreased quality of life during the presurgical orthodontic phase due to transient occlusion worsening and unfavorable aesthetic impact of decompensation [20].

It is reassuring to note clinical prudence among surveyed practitioners. Regarding therapeutic preferences, the majority (64.9%) consider that this approach should be reserved for specific cases, while 24.7% favor generalization. Only 10.4% prefer to adhere to the traditional approach. These results corroborate Sagar's study [19], where 51% of orthodontists still favor the conventional protocol.

This study provides a preliminary insight into Moroccan orthodontists' perceptions and practices regarding the SFA. It is the first exploratory survey conducted nationally on this topic, using a structured questionnaire based on scientific literature, thereby partially addressing the lack of local data and offering initial understanding of knowledge, attitudes, and practices.

However, several limitations must be acknowledged. The convenience sampling method via voluntary participation in a WhatsApp group limits sample representativeness and introduces selection bias, as respondents may be more engaged or interested than the general population. Self-administered questionnaires expose the results to reporting bias, including social desirability, potentially leading to overestimation of knowledge or underreporting of uncertainties. Additionally, researcher bias may arise from predominantly closed-ended questions shaped by the investigators' perspectives; efforts were made to mitigate this by providing neutral, comprehensive response options and including an "other" category.

Partial non-response bias was also noted, with some participants not completing all questions, potentially affecting result consistency and interpretability. Finally, the small number of practitioners who have actually adopted the surgery-first strategy limits statistical power and precludes robust, generalizable conclusions regarding its effects.

Importantly, this study cannot establish causal relationships between the strategy and perceived outcomes; only rigorous clinical trials or methodical application of causality criteria, such as Bradford Hill's, could validate such links.

5. Conclusions

Long considered a marginal option, orthognathic surgery without prior orthodontic preparation is regaining interest, driven by technological advances and evolving patient expectations. Our survey conducted in Morocco highlights a growing interest in the surgery-first approach, though its clinical implementation remains limited due to technical, clinical, and organizational barriers. Careful case selection and meticulous planning remain critical.

The high levels of practitioner and patient satisfaction observed in our study support the relevance of this approach in appropriately selected cases. Nevertheless, it underscores the need for continuous vigilance regarding postoperative follow-up, occlusal management, and relapse risk assessment. The sustainable integration of the surgery-first strategy requires evidence-based protocols, rigorous monitoring, and broader dissemination of knowledge—paving the way for multicenter research and the adoption of digital tools to establish this approach as a reliable and effective therapeutic standard.

Conflicts of Interest

The authors declare no conflicts of interest.

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