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Review article

Conventional and Digital Prosthetic Appliances in Cleft Lip and Palate Care: A Scoping Review

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Cleft Lip and Palate; Prosthetic Appliances; Presurgical Infant Orthopedics; Nasoalveolar Molding; Digital Impression

Abstract

Cleft lip and palate (CL/P) are congenital craniofacial conditions that require coordinated, multidisciplinary care from infancy through growth. Presurgical orthopedic and prosthetic appliances, such as feeding/palatal plates and nasoalveolar molding (NAM) devices, are used in selected patients, and digital workflows based on intraoral or three-dimensional (3D) scanning, computer-aided design and manufacturing (CAD/CAM), and 3D printing are increasingly proposed as alternatives to conventional fabrication. This study was conducted to map the available evidence on conventionally and digitally fabricated prosthetic and presurgical appliances for infants and young children with CL/P, to describe the characteristics of that evidence, and to identify research gaps. A scoping review was conducted and reported according to the PRISMA extension for Scoping Reviews (PRISMA-ScR), using a Population–Concept–Context framework. PubMed/MEDLINE, Scopus, Web of Science, Embase, and Google Scholar were searched. Two reviewers screened records independently. Data were charted using a predefined set of items and summarized descriptively (counts and percentages) and narratively. No formal risk-of-bias assessment or meta-analysis was undertaken. Thirty sources were included: 7 systematic reviews (3 with meta-analysis), 1 randomized controlled trial, 2 observational clinical studies, 13 case reports, case series, or technical reports, 4 workflow-development or technical-validation studies, 2 in vitro studies, and 1 narrative review. Twenty-three sources (76.7%) were published in 2021 or later. By focus, 10 addressed feeding/palatal plates and obturators, 4 digital impression or scanning, 5 conventional NAM, 9 digital NAM or presurgical plate workflows, and 2 artificial intelligence (AI)-supported planning. Digital workflows were feasible in all categories and offered advantages in data storage, reproducibility, and virtual adjustment. Improved fit was demonstrated mainly in vitro. The only randomized trial in neonates (n = 30) favored digital over tray impressions, whereas a meta-analysis of five randomized trials found no significant differences between digital and conventional NAM in several presurgical outcomes, with low-to-moderate certainty of evidence. Digital workflows redistributed rather than uniformly reduced work time. Digital technology should be regarded as an extension of established clinical practice rather than an automatic substitute for conventional methods. The evidence base is recent, small, and dominated by low-level designs. Future progress depends on standardized digital protocols, larger randomized trials, long-term follow-up, validated materials, and careful integration of AI with clinical expertise.

Introduction

Cleft lip and palate (CL/P) is among the most prevalent congenital craniofacial anomalies [1]. In Indonesia, the estimated national prevalence increased from 0.08% in 2013 to 0.12% in 2018, with roughly 7,500 new cases recorded annually [2]. Without adequate care, children with CL/P frequently develop speech and language delays that continue into adolescence and adulthood, with lasting social, emotional, and learning consequences [3]. Cleft development reflects interactions among genetic, environmental, and maternal factors, and in most cases no single cause can be identified [4]. Clefts are described by the structures affected (cleft lip, cleft palate, or cleft lip, alveolus, and palate), by laterality, and by completeness; clinical consequences include feeding difficulty, speech and resonance disorders, middle-ear disease, dental anomalies, and effects on maxillofacial growth. Care therefore requires a coordinated cleft team and longitudinal follow-up [5, 6].

The foremost early challenge is feeding. Oro-nasal communication prevents the infant from generating the negative intraoral pressure needed for suckling, which leads to nasal regurgitation, prolonged feeding, choking, aspiration risk, and undernutrition [7]. Feeding obturators (feeding plates) act as an artificial palate that separates the oral and nasal cavities and helps the tongue express milk [8]; they may also exert a secondary orthopedic effect on the palatal shelves and tongue posture [9]. Presurgical NAM combines molding of the alveolar segments with guidance of nasal and lip tissues before lip repair [10].

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Conventionally, these appliances are produced through a multi-step analog workflow that begins with an impression of the neonatal maxillary arch. This step is distressing for infant and parents and carries a risk of airway compromise [7]; modified putty–gauze techniques have been described to reduce that risk [11]. An inaccurate impression can lead to poor fit, return visits or remakes, and a longer treatment course [9]. Further limitations include dependence on clinician and technician skill, physical storage of casts, difficulty reproducing a lost appliance, and repeated adjustments during NAM programs.
CAD/CAM has been available in prosthodontics since the 1980s [12], and digital workflows (data acquisition, computer-aided design, automated manufacturing) have been shown to improve the speed, efficiency, and precision of restorations in adult prosthodontics [13]. In cleft care, 3D scanning, virtual design, and 3D printing now allow oral anatomy to be captured digitally and appliances to be designed on virtual models and printed. Feasibility has been demonstrated, but questions remain concerning accuracy, clinical outcomes, time, cost, patient safety, and standardization [14].
The literature on conventional and digital appliances for CL/P is heterogeneous, comprising randomized trials, systematic reviews, case reports, technical descriptions, and in vitro studies, and its extent and nature have not been systematically mapped. A scoping review is the appropriate design for mapping the breadth and nature of such evidence, clarifying concepts, and identifying gaps, rather than estimating pooled treatment effects [15, 16].
The objectives were: (1) to identify and categorize the types of prosthetic and presurgical appliances and fabrication workflows (conventional and digital) reported for infants and young children with CL/P; (2) to describe the characteristics of the available evidence (study design, year, geographic origin, and focus); (3) to summarize the technical, clinical, and process outcomes reported for conventional versus digital approaches; and (4) to identify gaps to guide future research.
The review question was: What is known from the published literature about the use, fabrication, clinical application, advantages, limitations, and outcomes of conventional and digitally fabricated prosthetic appliances (including feeding plates, palatal plates, and NAM devices) in infants and young children with cleft lip and/or palate?

Methods

Protocol and reporting

This scoping review followed the methodological framework of Arksey and O'Malley [16] and is reported in accordance with the PRISMA-ScR guideline [15]; the completed checklist is provided as Supplementary Table S2.

Eligibility criteria

Eligibility was defined using the Population–Concept–Context (PCC) framework (Table 1).

Table 1. Eligibility criteria according to the Population–Concept–Context framework.

Element	Inclusion and exclusion criteria
Population	Included: infants and children with cleft lip and/or palate, or in vitro/virtual cleft models representing this population. Excluded: studies not concerning CL/P or cleft-related prosthetic/orthopedic appliances.
Concept	Included: feeding plates, palatal plates, obturators, presurgical orthopedic appliances, or NAM devices fabricated conventionally or through digital scanning, CAD/CAM, 3D printing, digital workflows, or AI-supported planning; technical, clinical, process, or caregiver-related outcomes. Excluded: studies concentrating solely on later orthodontic treatment, definitive surgical repair, or adult prosthodontic rehabilitation, with no relevance to early cleft appliance fabrication.
Context	Any clinical, laboratory, or computational setting; no geographic restriction.
Types of sources	Included: randomized and non-randomized comparative studies, case series, case reports, in vitro studies using cleft models, systematic reviews, meta-analyses, scoping reviews, and relevant guidelines; English language or with an available full-text English translation. Excluded: conference abstracts, editorials, opinion pieces, publications lacking sufficient methodological information, and duplicate publications (the most complete or most recent version was retained).

Information sources and search strategy

A structured search was run in PubMed/MEDLINE, Scopus, Web of Science, Embase, and Google Scholar from the inception of each database to [date of last search]. Suitable Boolean operators, truncation, and MeSH terms (where available) were used to combine three concept blocks:
Condition: “cleft lip,” “cleft palate,” “cleft lip and palate,” “orofacial cleft,” “CL/P.”
Intervention/appliance: “feeding plate,” “feeding obturator,” “palatal plate,” “presurgical orthopedics,” “nasoalveolar molding,” “NAM,” “prosthetic appliance.”
Technology: “digital impression,” “intraoral scanner,” “digital scanning,” “CAD/CAM,” “computer-aided design,” “computer-aided manufacturing,” “3D printing,” “additive manufacturing,” “artificial intelligence.”

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The full PubMed/MEDLINE strategy, adapted for the other databases, is given in Supplementary Table S1. Reference lists of included articles and of pertinent systematic reviews were also screened for additional eligible sources.

Selection of sources of evidence
Records were exported to reference-management software and duplicates removed. Titles and abstracts were screened independently by two reviewers (Aisha A. and Karima S.) against the eligibility criteria; the full texts of potentially eligible records were then retrieved and independently assessed by the same reviewers.

Data charting and data items
Data were charted from each included source for the following items: first author and year, country of the corresponding institution, study design, population or sample, appliance type, conventional and/or digital technique, comparator, outcomes reported, and main findings. Sources were then classified by study design and by primary focus (feeding/palatal plates and obturators; digital impression and scanning; conventional NAM; digital NAM and presurgical plate workflows; AI-supported planning).

Critical appraisal of sources of evidence
Consistent with the aims of a scoping review, a formal risk-of-bias assessment was not performed. Design, sample size, and reported limitations were instead recorded to aid interpretation. When interpreting clinical outcomes, greater weight was given to systematic reviews, randomized trials, and comparative clinical studies, whereas case reports, case series, and in vitro studies were used mainly to describe feasibility, technical development, and emerging workflows.

Synthesis of results
Charted data were summarized descriptively as counts and percentages (design, publication period, geographic origin, and focus) and tabulated. Findings were synthesized narratively by appliance category and by conventional versus digital workflow. A meta-analysis was not conducted because the sources were not sufficiently homogeneous in design, interventions, comparators, and outcome measures.

Results

Selection of sources of evidence
The study selection process is shown in the PRISMA-ScR flow diagram (Figure 1). Database searching identified [n] records; after removal of [n] duplicates, [n] titles and abstracts were screened and [n] full-text articles were assessed for eligibility. [n] were excluded with reasons (Figure 1). A total of 30 sources were included in the evidence map and are listed in Table 3.

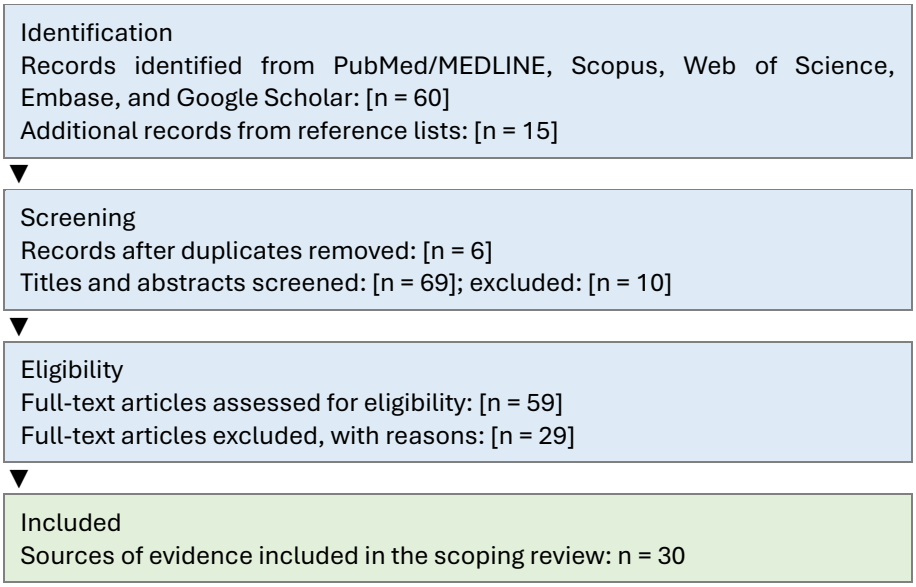


Figure 1. PRISMA-ScR flow diagram of the selection of sources of evidence.

Characteristics of sources of evidence
The 30 included sources were published between 1999 and 2026. Twenty-seven (90.0%) appeared in 2018 or later and 23 (76.7%) in 2021 or later, indicating that evidence on digital workflows is recent (Table 2). The most frequent designs were case reports, case series, and technical reports (13; 43.3%) and systematic reviews (7; 23.3%), of which three included a meta-analysis. Only one primary randomized controlled trial (RCT) was identified [7]; further randomized evidence was

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available only through one meta-analysis of five RCTs [17]. Workflow-development or technical-validation studies accounted for 4 sources (13.3%), in vitro studies for 2 (6.7%), observational clinical studies for 2 (6.7%), and a narrative review for 1 (3.3%).

By focus, feeding/palatal plates and obturators were the most frequent subject (10; 33.3%), followed by digital NAM and presurgical plate workflows (9; 30.0%), conventional NAM (5; 16.7%), digital impression or scanning (4; 13.3%), and AI-supported planning (2; 6.7%). The country of the corresponding institution could be determined for 19 sources: 7 from Europe, 6 from Asia, and 6 from North America (all from the United States).

Table 2. Descriptive characteristics of the included sources (n = 30).

Characteristic	n	%
Publication period		
1999–2015	3	10.0
2018–2020	4	13.3
2021–2023	11	36.7
2024–2026	12	40.0
Study design		
Systematic review without meta-analysis	4	13.3
Systematic review with meta-analysis	3	10.0
Randomized controlled trial	1	3.3
Observational clinical study (retrospective or multicenter)	2	6.7
Case report, case series, or technical report	13	43.3
Workflow-development or technical-validation study	4	13.3
In vitro comparative study	2	6.7
Narrative review	1	3.3
Primary focus (main category of appliance or technology)		
Feeding/palatal plates and obturators	10	33.3
Digital impression and scanning	4	13.3
Conventional NAM	5	16.7
Digital NAM and presurgical plate workflows	9	30.0
AI-supported planning	2	6.7
Geographic origin (country of corresponding institution) *		
Europe	7	36.8
Asia	6	31.6
North America	6	31.6
Not yet determined	11	–

*Percentages are rounded to one decimal place. *Percentages for geographic origin are calculated on the 19 sources for which origin was determined.*

Results of individual sources of evidence

Feeding plates, palatal plates, and obturators. Conventional feeding appliances are typically made from acrylic resins, and the weight, thickness, and borders of the appliance are particularly important in an infant's small mouth. Conventional appliances were described mainly in case reports [11, 18], including a single-visit technique using a putty–gauze hybrid impression [11]. Their effects on long-term growth and weight vary with the appliance and the individual case [5]. Digital and 3D-printed alternatives were reported in one RCT, one systematic review, one case series, three case reports, one narrative review with a case report, and two in vitro studies (Table 3). Seven of these nine sources were descriptive or in vitro; in vitro results described fit and retention and did not assess clinical relevance.

Digital impression and scanning. Intraoral scanners capture 3D models directly from the mouth, avoiding trays and viscous materials and the distortion, discomfort, and storage problems of conventional impressions [36]. Digital impressions were reported to be feasible in newborns and preschool children with CL/P and described as less invasive than conventional impressions, although the reports come from small samples [22]. Scanning was also used to generate impressions for speech aids and obturators [19], and a method for 3D capture and analysis of the nasolabial region was validated [21]. Scan quality depends on field control, because oral fluids can distort the data [37]. Of the common file formats, STL is the most widely used because of its simplicity and compatibility, whereas OBJ and PLY can store color and texture at the cost of greater storage capacity [38]. In adult restorative prosthodontics, systematic reviews have frequently reported comparable or superior results for digital versus conventional impressions [39]; these findings cannot be extrapolated automatically to neonates with cleft anatomy.

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Table 3. Characteristics of selected studies on digital fabrication of feeding plates and obturators, ordered by level of evidence.

Author(s), year	Study design	Population/sample	Intervention (digital)	Comparison (conventional)	Key findings
Krishnakumar & Kalaskar, 2025 [7]	Randomized controlled trial	Neonates with CL/P (n = 30)	Digital impression technique	Tray impression technique	Digital technique reported as safer (no aspiration risk), faster, and more accurate.
Unnikrishnan et al., 2024	Systematic review	Infants with CL/P	Digital impressions	Conventional impressions	Parents reportedly preferred digital impressions; operators favored them because they reduced stress.
Kapoor et al., 2021	Case series	Infants with cleft palate	3D-printed bottle-attached obturator (D-cleft) made of PLA	Conventional obturator	Reported as effective and comfortable; authors state it overcame limitations of conventional methods (brittleness, need for impressions).
Singh et al., 2024	Case report	8-day-old infant, complete cleft palate	Novel self-retentive obturator	No comparator	Reported as cost-effective and easy to use, with no need for additional retention aids.
Nanduri et al., 2023	Case report	7-day-old infant, unilateral cleft	Digital intraoral impression for feeding plate fabrication	No comparator	Workflow described as accurate, minimally invasive, and clinically acceptable.
Naveau et al., 2021 [9]	Case report	Newborn, unilateral cleft	Digitalization of existing tray, CAD design, 3D printing	Traditional fabrication	Customized plates produced rapidly and at low cost.
Divakar et al., 2025	Narrative review and case report	Infants with CL/P	3D-printed feeding plate and nasal stent	No comparator	Emphasizes CAD/CAM for presurgical NAM and feeding plates.
Akinci et al., 2025	In vitro comparative	3D models of bilateral, unilateral right, and left clefts (n = 10 each)	3D additive manufacturing of feeding plates	Conventional compression molding	In vitro, printed plates showed significantly better adaptation (less misfit) for all cleft types ($p < 0.05$); clinical relevance not assessed.
Oday et al., 2025	In vitro comparative	3D-printed models of infant maxilla (n = 10)	Thermoformed PET-G and PET-G/EVA plates	PMMA plates	In vitro, PET-G plates showed superior fit and retention vs PMMA and PET-G/EVA ($p < 0.05$); clinical relevance not assessed.

CL/P, cleft lip and palate; PET-G, polyethylene terephthalate glycol; EVA, ethylene vinyl acetate; PMMA, polymethyl methacrylate; PLA, polylactic acid. Entries were extracted from the systematic review of CAD/CAM feeding obturator fabrication [20].

Conventional NAM. NAM uses an intraoral appliance with nasal components to shape the nasal cartilage and soft tissues and approximate the alveolar segments before lip repair [10]. A retrospective study that followed patients to nine years of age observed that certain nasal-symmetry measures remained more favorable in the NAM group than in the surgery-only group, but its design and small sample limit interpretation [23]. A systematic review and critical appraisal of 88 studies found support for effectiveness in some short- and medium-term outcomes, together with a relatively high risk of bias in many studies [25]. A systematic review and meta-analysis of long-term effects reported encouraging findings but no consistent superiority across measures [24]. A review confined to complete unilateral cleft lip, alveolus, and palate identified low-certainty evidence for short-term reduction in cleft width, with insufficient data on long-term nasal aesthetics [26].

Digital NAM and presurgical plate workflows. Krey and colleagues showed in two cases that presurgical orthodontic plates can be made using digital scanning, design software, and a DLP printer [27]. Ahmed and colleagues digitized an impression, adjusted it virtually, and printed sequential NAM devices [28]. Gong and colleagues described a fully digital workflow

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producing a series of prefabricated NAM appliances in a biocompatible material [29], and Carter and colleagues combined facial and perioral scanning, 3D modeling, and resin printing to produce NAM appliances with a postoperative nasal stent [32]. A virtual, non-invasive NAM plate construction method using intraoral scanning, CAD, and milling was also reported [30]. A preliminary study by Ritschl and colleagues [reference to be added] found that CAD/CAM-designed NAM appliances achieved changes comparable to conventional appliances, with no statistically significant differences in the measures assessed. In a point-of-care workflow, customized passive plates were produced using scanning, open-source design software, and 3D printing; data capture was brief and hands-on clinical time was reduced, but total turnaround time was longer than for the conventional method [31]. A complete digital workflow for presurgical palatal plates in newborns and infants was also described [33]. The meta-analysis of five RCTs comparing digital and conventional NAM is summarized in Section 3.4 [17].

AI-supported planning. Two sources addressed automation. One described automated, data-driven plate computation for presurgical treatment [34]. A systematic review of AI-driven automation of NAM device planning concluded that the field is promising, but that performance, methodological consistency, and strength of evidence require further development and clinical validation [35].

Synthesis of results across outcome domains

Table 5 synthesizes the direction of reported findings and the level of supporting evidence for each outcome domain. A systematic review and meta-analysis of five RCTs comparing digital and conventional NAM found no statistically significant differences in several presurgical outcomes, although differences were observed in selected measures, including nasal-columella deviation and arch length; the authors rated the certainty of evidence for certain comparisons as low to moderate and noted heterogeneity among studies [17]. Time comparisons require care: direct clinical time may be reduced and saved files may allow several appliances to be produced, but total turnaround depends on printing, processing, and preparation, so digital manufacturing redistributes tasks (file processing, print preparation, support removal, post-processing) rather than uniformly shortening the workflow [31, 33].

Table 4. Outcome domains, direction of reported findings, and supporting evidence.

Outcome domain	Direction of reported findings	Supporting sources	Level of evidence
Data acquisition	Scanning feasible in newborns and preschoolers; described as less invasive than impressions; digital technique reported as faster and more accurate in one RCT.	RCT (n = 30) [7]; two-center clinical experience [22]; case reports	Limited: one small RCT, small clinical samples
Accuracy and fit	Comparable changes with CAD/CAM NAM in one preliminary study; better fit and retention of printed or thermoformed plates in vitro.	In vitro studies (Table 4); preliminary comparative study [reference to be added]	Low: in vitro; clinical relevance not assessed
Time and appointments	Mixed: reduced hands-on clinical time in some protocols; longer total turnaround in a point-of-care study.	Workflow studies [31, 33]	Low: single-center workflow studies
Safety and comfort	Direct scanning may avoid impression-material airway risks; parents and operators reported preference; scanning still needs positioning, stabilization, and expertise.	RCT [7]; systematic review (Table 4); clinical reports [22]	Low
Cost	Higher initial investment; low-cost customized plates reported in case reports; no center-level economic analyses identified.	Case reports (Table 4)	Very low: descriptive
Reproduction and documentation	Stored files allow reproduction of lost appliances and comparison of sequential models.	Digital workflow reports [28, 29, 32]	Descriptive
Clinical outcomes (NAM)	No significant differences in several presurgical outcomes; differences in selected measures (nasal-columella deviation, arch length).	Meta-analysis of five RCTs [17]	Low to moderate certainty
AI-supported planning	Promising; requires validation and human oversight.	[34, 35]	Early-stage

Advantages and obstacles reported in the sources

The advantages and obstacles of digital technologies reported across the included sources are summarized in Table 6.

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Table 5. Advantages and obstacles of digital technologies reported in the included sources.

Reported advantages	Reported obstacles
Digital models can be stored and retrieved at later appointments.	Upfront cost of scanners, software, printers, materials, and training; learning curve.
An appliance can be reproduced from a saved file if lost or replaced.	Scanning is difficult when infants move or when cleft anatomy is complex.
Adjustments can be made virtually before manufacturing.	Digital models must be inspected and errors corrected before design.
In some NAM protocols, a series of appliances can be designed in advance.	Software, printers, materials, and protocols vary between centers.
Data can be shared more easily within the multidisciplinary team.	Printed materials must be evaluated after finishing and their suitability for intraoral use confirmed.
Some risks of conventional impression materials may be reduced.	Integration with institutional systems may be difficult.
Digital data create opportunities for automation and AI.	Many studies have small samples or are case reports.

Discussion

This scoping review mapped 30 sources on conventional and digital prosthetic and presurgical appliances for infants and young children with CL/P. The evidence base is recent (76.7% published since 2021) and dominated by low-level designs: 20 of 30 sources (66.7%) were case reports, case series, technical reports, workflow-development studies, in vitro studies, or a narrative review; 7 were systematic reviews; and only one primary RCT was identified [7]. Digital workflows were shown to be feasible in every appliance category. Their reported value lies in three interrelated areas: more precise anatomical recording, broader possibilities for customized design and manufacturing, and better data management and reproducibility. These are workflow advantages, and the evidence has not shown that they consistently translate into clearly superior clinical outcomes compared with conventional methods [17].

An appliance is not a stand-alone intervention; it is embedded in a pathway that includes feeding, medical follow-up, orthodontics, surgery, speech, hearing, and other services, and contemporary guidelines endorse multidisciplinary teams as the cornerstone of care [6]. Outcomes also depend on cleft size, alveolar-segment shape, infant growth, applied forces, duration of wear, team experience, and follow-up, so digital accuracy should not be regarded as the sole indicator of success. Findings from in vitro studies describe technical performance only and cannot be taken as evidence of improved infant-centered outcomes. Time findings point to a redistribution of work rather than a uniformly shorter workflow [31]. Infant safety remains the fundamental criterion: scanning is feasible in newborns, but safety also depends on positioning, stabilization, and staff experience, and digital systems introduce equipment-, material-, and manufacturing-related risks, so digitization changes the nature of the risks rather than removing the need for precautions.

At present, integrating conventional expertise with digital tools may be more practical than adopting either pathway exclusively: the infant can be scanned digitally and the appliance designed with CAD, while conventional skills remain valuable for adjustment, polishing, and clinical inspection. Digitization at a center depends on service volume, infrastructure, and training capacity. Investment may be justified where scanners and printers are used regularly, whereas adoption may be difficult in resource-limited settings, so institutional decisions should rest on a realistic cost-effectiveness analysis. Digital development changes how treatment is delivered rather than the treatment goal, which remains the best feasible presurgical relationship and support of functional and aesthetic outcomes within safe care. Use of digital tools should be guided by clinical assessment of each case, and clinical follow-up, soft-tissue evaluation, and verification of appliance safety must remain integral to treatment.

Larger randomized trials of digital versus conventional appliances using standardized digital protocols and movement schedules. Long-term follow-up of nasal, alveolar, and feeding outcomes; feeding efficiency and weight gain were not reported. Validated printing materials suitable for intraoral use in infants. Cost-effectiveness analyses at the center level rather than per appliance. Integrated digital systems that document the child's condition from the beginning, update models over time, generate sequential appliances, and link outcomes to a clinical database, provided that data protection is ensured. Clinical validation and human oversight of AI-supported anatomical analysis and design proposals [35].

Limitations

As a scoping review, this work did not include a formal risk-of-bias assessment or a quantitative synthesis, and the evidence is dominated by case reports, small comparative studies, and in vitro models. Restriction to English-language sources may have led to relevant studies being missed. Some sections rely on secondary sources (systematic reviews) rather than primary studies; this applies particularly to the studies in Table 4, which were extracted from a single systematic review [20]. Categorization of study design and focus was based on how each source described itself and may involve some overlap.

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Conclusions

Cleft lip and palate are complex congenital conditions that demand multidisciplinary care, and presurgical prosthetic and orthopedic appliances are a significant component of certain treatment pathways. Digital technology has created new opportunities for recording anatomy, designing and manufacturing appliances, and documenting treatment; intraoral scanning is feasible in newborns, and customized appliances can be produced with CAD/CAM and 3D printing. Available studies suggest that digital workflows may improve data handling, reproducibility, and selected technical outcomes; however, evidence for improved infant-centered clinical outcomes remains limited, and the most recent comparative evidence does not support a claim of clinical superiority over conventional appliances [17]. Digital workflows redistribute rather than uniformly reduce workload, and clinical expertise remains essential irrespective of the degree of automation.

Conflict of interest. Nil

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Supplementary Table S2. PRISMA-ScR checklist

Item	PRISMA-ScR checklist item	Reported in
1	Title: identify the report as a scoping review	Title
2	Structured summary	Abstract
3	Rationale	Section 1.2
4	Objectives (and review question)	Section 1.2
5	Protocol and registration	Section 2.1
6	Eligibility criteria	Section 2.2; Table 1
7	Information sources	Section 2.3
8	Search	Section 2.3; Supplementary Table S1
9	Selection of sources of evidence	Section 2.4
10	Data charting process	Section 2.5
11	Data items	Section 2.5
12	Critical appraisal of individual sources of evidence (optional)	Section 2.6 (not performed)
13	Synthesis of results	Section 2.7
14	Selection of sources of evidence (results)	Section 3.1; Figure 1
15	Characteristics of sources of evidence	Section 3.2; Tables 2–3
16	Critical appraisal within sources of evidence (optional)	Not performed (Section 2.6)
17	Results of individual sources of evidence	Section 3.3; Table 4
18	Synthesis of results	Sections 3.4–3.5; Tables 5–6
19	Summary of evidence	Section 4.1–4.3
20	Limitations	Section 4.5
21	Conclusions	Section 5
22	Funding (optional)	End of Section 5

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