

C | A | U
Christian-Albrechts-Universität zu Kiel
Medizinische Fakultät

Kassenärztliche Vereinigung
Schleswig-Holstein

Verlagerte 3er – Kreuzbiss – Nichtanlagen

Schwierige KFO-Fälle erkennen und behandeln (lassen)

Bildquelle: stock.adobe.com

31. Schleswig-Holsteinischer Zahnärztetag | 16. März 2024 | Prof. Dr. Sinan Şen

Schwierige KFO-Fälle erkennen und behandeln (lassen)

- Verlagerte 3er
- Frontaler Kreuzbiss
- Nichtanlagen

Prävalenz der verlagerten Zähne

Systematische Übersichtarbeit (De Ridder et al. 2022)

Identification

Records identified from:
Databases (n = 6775)
PubMed (n = 1793)
Cochrane (n = 148)
Embase (n = 3266)
Web of Science (n = 1568)

Included

Studies included in review
(n = 123)

De Ridder, L., Aleksieva, A., Willems, G., Declerck, D., and Cadenas de Llano-Perula, M. (2022). Prevalence of Orthodontic Malocclusions in Healthy Children and Adolescents: A Systematic Review. Int J Environ Res Public Health 19. 10.3390/ijerph19127446.

Prävalenz der verlagerten Zähne

Systematische Übersichtarbeit (De Ridder et al. 2022)

... liegt bei etwa **3-5 %** der gesunden **Kinder und Jugendlichen**.

Continent	Agnesis/Hypodontia	Mesiodens	Supernumerary Teeth/Hyperdontia	Hypo-Hyperdontia	Impacted/Retained Teeth (Impeded Eruption)	Ectopic Eruption	Transposition
Africa	3.4 ± 2.2%	NA	0.3 ± 0.2%	NA	3.0 ± 0.0% *	9.7 ± 0.0% *	0.2 ± 0.1%
America	5.0 ± 3.3%	1.5 ± 0.0% *	1.9 ± 0.4%	NA	3.9 ± 2.9%	1.5 ± 0.0% *	NA
Asia	8.1 ± 6.3%	NA	2.7 ± 1.6%	NA	4.8 ± 4.1%	6.0 ± 4.0%	0.5 ± 0.4%
Europe	6.9 ± 3.2%	1.3 ± 0.9%	2.3 ± 1.3%	0.4 ± 0.1%	3.8 ± 0.8%	7.5 ± 0.0% *	1.3 ± 0.7%
Oceania	7.0 ± 0.0% *	NA	1.0 ± 0.0% *	NA	5.0 ± 0.0% *	NA	NA

De Ridder, L., Aleksieva, A., Willems, G., Declerck, D., and Cadenas de Llano-Perula, M. (2022). Prevalence of Orthodontic Malocclusions in Healthy Children and Adolescents: A Systematic Review. Int J Environ Res Public Health 19. 10.3390/ijerph19127446.

Prävalenz der verlagerten 3er

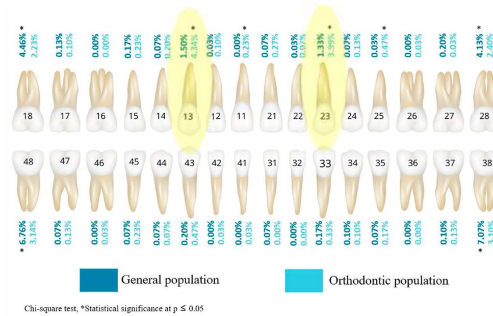
Übersicht der verlagerten Zähne

In der allgemeinen Bevölkerung

8er sind am häufigsten (5-7%)

Danach **OK 3er (1,5%)**

→ **ca. 5 % aller KFO-Fälle!**



Alalola, B.S., Almasoud, F.S., Alghamdi, K.B., Almalki, L.M., Alodan, Y.A., Alotaibi, S.N., and Alali, S.R. (2023). Comparing the prevalence of impacted teeth through radiographic evidence among orthodontic and general populations: A secondary data analysis. *Saudi Dent J* 35, 1053-1057. 10.1016/j.sdentj.2023.10.022.

Management der verlagerten 3er

Diagnose (Klinisch und Röntgenologisch)

Einschätzen des Schwierigkeitsgrads

- Management:
- Chirurgische Freilegung und Anschlingung (offen vs. geschlossen)
 - Platzschaffen (Extraktion, Distalisation) und Mobilisation
 - Autotransplantation

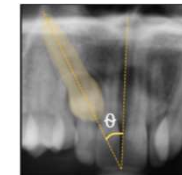
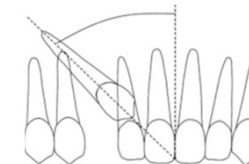
Diagnose der verlagerten 3er

Mögliche Ursachen klinisch und röntgenologisch beurteilen

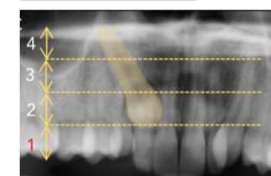
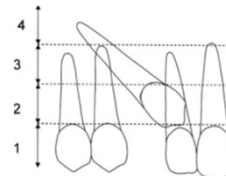
- Aberration auf dem langen Durchbruchweg
- Platzmangel (primäre und sekundäre Engstände)
- Überzählige Zähne, Odontome
- Entzündliche Prozesse, Zysten
- Persistierende Milchzähne
- Traumen
- Ankylose
- Angeborene Keimdystopie

2D-Diagnostik – Verlagerte 3er

1. Winkel 3er zur Mittellinie



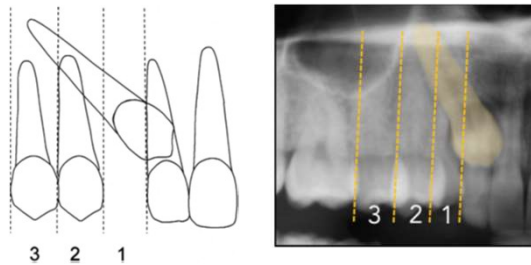
2. Höhe Krone 3er zur SZG 1er



Fleming, P.S., Scott, P., Heidari, N., and Dibiase, A.T. (2009). Influence of radiographic position of ectopic canines on the duration of orthodontic treatment. *The Angle orthodontist* 79, 442-446. 10.2319/042708-238.1.
 Farha, P., Nguyen, M., Karanth, D., Dolce, C., and Arqub, S.A. (2023). Orthodontic Localization of Impacted Canines: Review of the Cutting-edge Evidence in Diagnosis and Treatment Planning Based on 3D CBCT Images. *Turk J Orthod* 36, 261-269. 10.4274/TurkJOrthod.2023.2022.131.

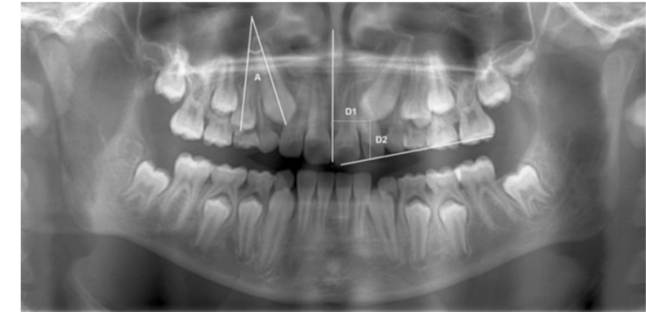
2D-Diagnostik – Verlagerte 3er

3. Lage Apex 3er



Fleming, P.S., Scott, P., Heidari, N., and Dibiase, A.T. (2009). Influence of radiographic position of ectopic canines on the duration of orthodontic treatment. *The Angle orthodontist* 79, 442-446. 10.2319/042708-238.1.
 Farha, P., Nguyen, M., Karanth, D., Dolce, C., and Arqub, S.A. (2023). Orthodontic Localization of Impacted Canines: Review of the Cutting-edge Evidence in Diagnosis and Treatment Planning Based on 3D CBCT Images. *Turk J Orthod* 36, 261-269. 10.4274/TurkJOrthod.2023.2022.131.

2D-Diagnostik – Verlagerte 3er



Die Wahrscheinlichkeit für die Verlagerung :

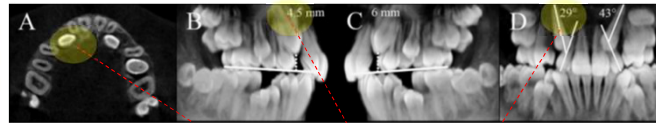
$$= \exp(\mu) / (1 + \exp(\mu)) ;$$

$$\mu = -14,16 + 0,1675 * A + 0,0648 * D1 - 0,0423 * D2$$

Alqerban, A., Storms, A.S., Voet, M., Fieuws, S., and Willems, G. (2016). Early prediction of maxillary canine impaction. *Dento maxillo facial radiology* 45, 20150232. 10.1259/dmfr.20150232.

3D-Diagnostik – Verlagerte 3er

Variable	Estimate	Odds ratio (95% CI)	P value
Intercept	-5,66		
Canine crown position			0,0014
Buccally	2,11	8,26 (1,27, 48,52)	
Palatally	3,28	26,45 (3,90, 179,51)	0,0008
Line of the arch			
Canine cusp tip to occlusal (mm) on sagittal view	0,27	1,31 (1,12, 1,52)	0,0006
Canine angle (°) to the lateral incisor on coronal view	0,11	1,12 (1,04, 1,19)	0,0014



Für 13 gilt die Wahrscheinlichkeit für die Verlagerung...

$$\mu_{13} = -5,66 + 2,11 * 0 + 3,28 * 1 + 0,27 * 4,5 + 0,11 * 29 = 2,03$$

$$= \exp(2,03) / (1 + \exp(2,03)) = 88\%$$

Für 23 gilt ...

$$\mu_{23} = -5,66 + 2,11 * 0 + 3,28 * 1 + 0,27 * 6 + 0,11 * 43 = 3,97$$

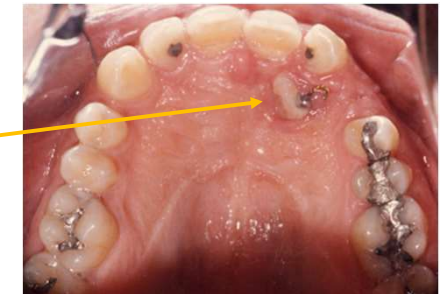
$$\exp(3,97) / (1 + \exp(3,97)) = 98\%$$

where $\mu = -5,66 + 2,11 * x_1 + 3,28 * x_2 + 0,27 * x_3 + 0,11 * x_4$
 $x_1 = 1$ if the canine crown position is buccally oriented and $x_1 = 0$ if not; $x_2 = 1$ if the canine crown position is palatally oriented and $x_2 = 0$ if not; x_3 is the linear measurements from canine cusp tip to the occlusal aspect in the sagittal view (millimeters); and x_4 is the canine angle (degrees) to the lateral incisor in the coronal view (degrees).

Alqerban, A., Jacobs, R., Fieuws, S., and Willems, G. (2015). Radiographic predictors for maxillary canine impaction. *American journal of orthodontics and dentofacial orthopedics* 147, 345-354. 10.1016/j.ajodo.2014.11.018.

Lokalisation der verlagerten 3er

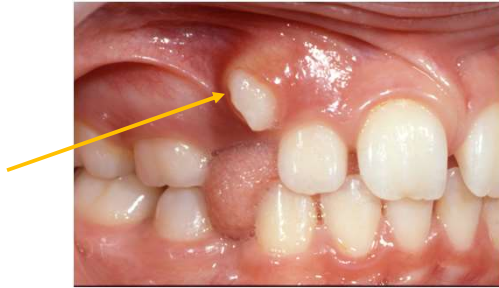
- palatinal 55%
- vestibulär 32%
- zentral 13%



Merke: palatinal impaktierte Zähne sind meist horizontal verlagert

Lokalisation der verlagerten 3er

- palatinal 55%
- vestibulär 32%
- zentral 13%



Merke: bukkal verlagerte Zähne weichen vorwiegend in **vertikaler** Richtung ab

Lokalisation der verlagerten 3er

- palatinal 55%
- vestibulär 32%
- zentral 13%



KFO-Management – Verlagerte 3er



vs.



Open versus closed surgical exposure of canine teeth that are displaced in the roof of the mouth (Review)

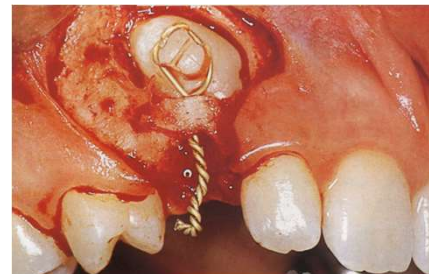
Parkin N, Benson PE, Thind B, Shah A, Khalil I, Ghafoor S

Implications for practice

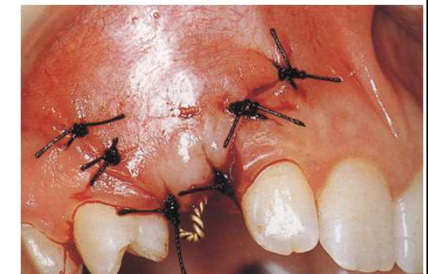
This review has found some evidence suggesting that **there are no differences in outcomes** when performing **either an open or a closed surgical exposure** for an unerupted palatally displaced maxillary canine; however, the quality of this evidence is low. The lack of evidence of a statistical or clinical difference between the two surgical techniques suggests that currently the method of exposing a PDC **can be left to the personal preference and choice of the surgeon and orthodontist.**

Parkin, N., Benson, P.E., Thind, B., Shah, A., Khalil, I., and Ghafoor, S. (2017). Open versus closed surgical exposure of canine teeth that are displaced in the roof of the mouth. *The Cochrane database of systematic reviews* 8, CD006966. 10.1002/14651858.CD006966.pub3.

KFO-Management – Verlagerte 3er



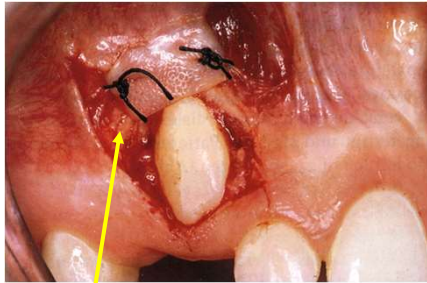
Bracket mit Drahtligatur als Zugvorrichtung durch die Alveole des extrahierten Milchzahnes



Reponierter Schleimhautperiostlappen - Geschlossene Technik (nach Diedrich)

Parkin, N., Benson, P.E., Thind, B., Shah, A., Khalil, I., and Ghafoor, S. (2017). Open versus closed surgical exposure of canine teeth that are displaced in the roof of the mouth. *The Cochrane database of systematic reviews* 8, CD006966. 10.1002/14651858.CD006966.pub3.

KFO-Management – Verlagerte 3er



Zone befestigter Gingiva, 2 mm oberhalb der Schmelz-Zement-Grenze des freigelegten Zahnes
Offene Technik



Befund 4 Wochen post op., der einzuordnende Eckzahn bringt die Zone keratinisierter Gingiva mit nach kaudal

Parkin, N., Benson, P.E., Thind, B., Shah, A., Khalil, I., and Ghafoor, S. (2017). Open versus closed surgical exposure of canine teeth that are displaced in the roof of the mouth. *The Cochrane database of systematic reviews* 8, CD006966. 10.1002/14651858.CD006966.pub3.

Fall 1: KFO-Management – Verlagerte 3er



Persistenz 53,
Verlagerung 13?

Taffarel, I.P., Saga, A.Y., Locks, L.L., Ribeiro, G.L., and Tanaka, O.M. (2018). *Clinical Outcome of an Impacted Maxillary Canine: From Exposition to Occlusion. J Contemp Dent Pract* 19, 1552-1557.

Fall 1: KFO-Management – Verlagerte 3er



Persistenz 53,
Palatinale Verlagerung 13

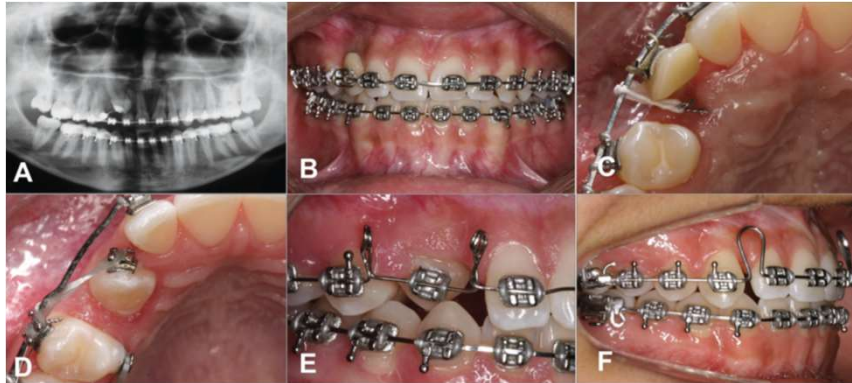
Taffarel, I.P., Saga, A.Y., Locks, L.L., Ribeiro, G.L., and Tanaka, O.M. (2018). *Clinical Outcome of an Impacted Maxillary Canine: From Exposition to Occlusion. J Contemp Dent Pract* 19, 1552-1557.

Fall 1: KFO-Management – Verlagerte 3er



Taffarel, I.P., Saga, A.Y., Locks, L.L., Ribeiro, G.L., and Tanaka, O.M. (2018). *Clinical Outcome of an Impacted Maxillary Canine: From Exposition to Occlusion. J Contemp Dent Pract* 19, 1552-1557.

Fall 1: KFO-Management – Verlagerte 3er



Taffarel, I.P., Saga, A.Y., Locks, L.L., Ribeiro, G.L., and Tanaka, O.M. (2018). *Clinical Outcome of an Impacted Maxillary Canine: From Exposition to Occlusion. J Contemp Dent Pract* 19, 1552-1557.

Fall 1: KFO-Management – Verlagerte 3er



Taffarel, I.P., Saga, A.Y., Locks, L.L., Ribeiro, G.L., and Tanaka, O.M. (2018). *Clinical Outcome of an Impacted Maxillary Canine: From Exposition to Occlusion. J Contemp Dent Pract* 19, 1552-1557.

Fall 1: KFO-Management – Verlagerte 3er



Taffarel, I.P., Saga, A.Y., Locks, L.L., Ribeiro, G.L., and Tanaka, O.M. (2018). *Clinical Outcome of an Impacted Maxillary Canine: From Exposition to Occlusion. J Contemp Dent Pract* 19, 1552-1557.

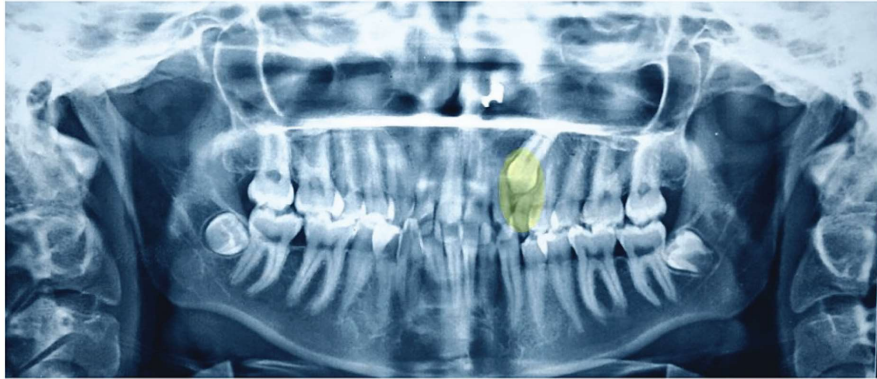
Fall 2: KFO-Management – Verlagerte 3er



Persistenz 63,
Verlagerung 23?

Bharti, L., Jr., Shrivastav, S.S., Sanchla, A.D., and Kamble, R. (2023). *Rescuing the Hidden Canine: A Case Report of Successful Surgical Exposure and Orthodontic Management. Cureus* 15, e49888. 10.7759/cureus.49888.

Fall 2: KFO-Management – Verlagerte 3er



Bharti, L., Jr., Shrivastav, S.S., Sanchla, A.D., and Kamble, R. (2023). *Rescuing the Hidden Canine: A Case Report of Successful Surgical Exposure and Orthodontic Management.* *Cureus* 15, e49888. 10.7759/cureus.49888.

Fall 2: KFO-Management – Verlagerte 3er

Diagnose:

Ausgeprägte Engstände im
OK/UK, Verlagerung 23

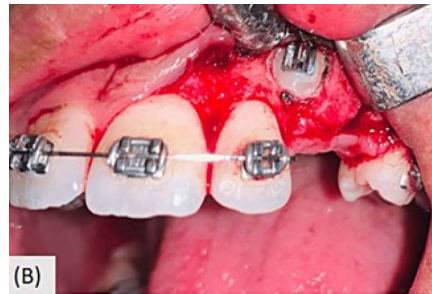
Therapie:

Mobilisation 23 und
Platzbeschaffung durch
Extraktion 14, 24, 34 und 44



Bharti, L., Jr., Shrivastav, S.S., Sanchla, A.D., and Kamble, R. (2023). *Rescuing the Hidden Canine: A Case Report of Successful Surgical Exposure and Orthodontic Management.* *Cureus* 15, e49888. 10.7759/cureus.49888.

Fall 2: KFO-Management – Verlagerte 3er



Bharti, L., Jr., Shrivastav, S.S., Sanchla, A.D., and Kamble, R. (2023). *Rescuing the Hidden Canine: A Case Report of Successful Surgical Exposure and Orthodontic Management.* *Cureus* 15, e49888. 10.7759/cureus.49888.

Fall 2: KFO-Management – Verlagerte 3er



Bharti, L., Jr., Shrivastav, S.S., Sanchla, A.D., and Kamble, R. (2023). *Rescuing the Hidden Canine: A Case Report of Successful Surgical Exposure and Orthodontic Management.* *Cureus* 15, e49888. 10.7759/cureus.49888.

Fall 2: KFO-Management – Verlagerte 3er



Bharti, L., Jr., Shrivastav, S.S., Sanchla, A.D., and Kamble, R. (2023). Rescuing the Hidden Canine: A Case Report of Successful Surgical Exposure and Orthodontic Management. *Cureus* 15, e49888. 10.7759/cureus.49888.

Fall 3: KFO-Management – Verlagerte 3er

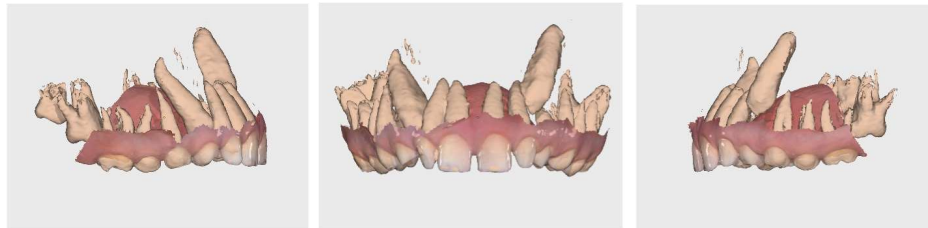


Herausnehmbare Mobilisationsplatte für
Mobilisation 15, 23 und 25 (Zugkraft= 0,7 N)

Pat. 12 J !

Persistenz 55, 63, 65, Verlagerung 15, 23, 25

Fall 4: KFO-Management – Verlagerte 3er



Şen, S., Puchert, K., and Töckelt, Ö. (2024). Möglichkeiten der modernen Kieferorthopädie: Von der Ausgangssituation bis zur Eingliederung – Der digitale Workflow für herausnehmbare und festsitzende CAD/CAM-Apparaturen. *Informationen aus Orthodontie & Kieferorthopädie* 56, 11-22. 10.1055/a-2168-8845.

Fall 4: KFO-Management – Verlagerte 3er



Festsitzende CAD/CAM Mobilisationsapparat für
Mobilisation 13, 17, 23 und 27 (Zugkraft= 0,7 N)

Şen, S., Puchert, K., and Töckelt, Ö. (2024). Möglichkeiten der modernen Kieferorthopädie: Von der Ausgangssituation bis zur Eingliederung – Der digitale Workflow für herausnehmbare und festsitzende CAD/CAM-Apparaturen. *Informationen aus Orthodontie & Kieferorthopädie* 56, 11-22. 10.1055/a-2168-8845.

Fall 4: KFO-Management – Verlagerte 3er



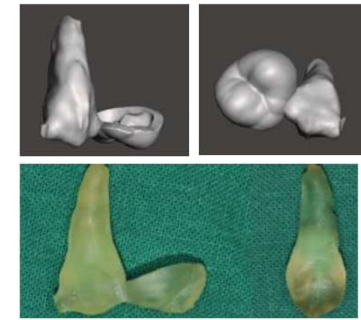
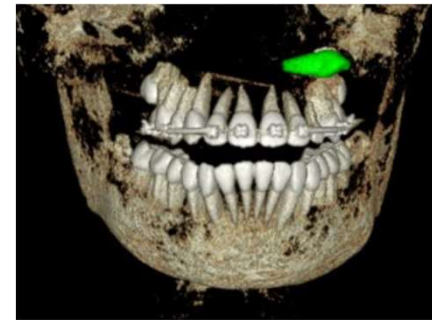
am Tag der Eingliederung



nach 6 Monaten

Şen, S., Puchert, K., and Töckelt, Ö. (2024). *Möglichkeiten der modernen Kieferorthopädie: Von der Ausgangssituation bis zur Eingliederung – Der digitale Workflow für herausnehmbare und festsitzende CAD/CAM-Apparaturen. Informationen aus Orthodontie & Kieferorthopädie* 56, 11-22. 10.1055/a-2168-8845.

Autotransplantation der verlagerten 3er



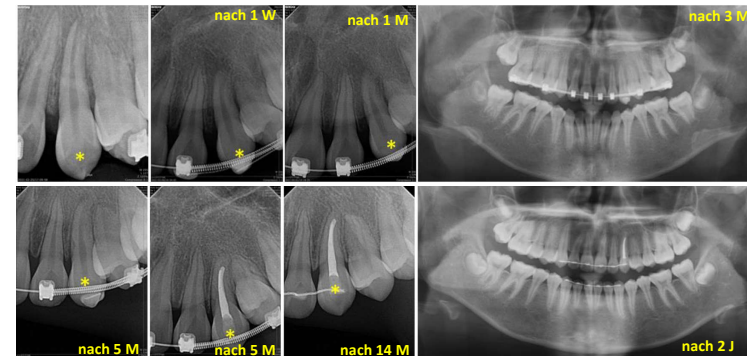
Park, S., Lee, H., Lee, E., Jeong, T., Lee, H., and Shin, J. (2023). *Guided Autotransplantation of Impacted Canines Using a CAD/CAM Surgical Template. Children (Basel)* 10. 10.3390/children10040708.

Autotransplantation der verlagerten 3er



Park, S., Lee, H., Lee, E., Jeong, T., Lee, H., and Shin, J. (2023). *Guided Autotransplantation of Impacted Canines Using a CAD/CAM Surgical Template. Children (Basel)* 10. 10.3390/children10040708.

Autotransplantation der verlagerten 3er



Park, S., Lee, H., Lee, E., Jeong, T., Lee, H., and Shin, J. (2023). *Guided Autotransplantation of Impacted Canines Using a CAD/CAM Surgical Template. Children (Basel)* 10. 10.3390/children10040708.

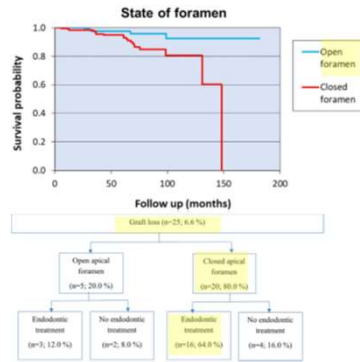
Autotransplantation der verlagerten 3er

ORIGINAL ARTICLE AJO-DO

Survival of retained permanent canines after autotransplantation: A retrospective cohort study

all Krupp, Petrakakis, Jost-Brinkmann, Sebastian Meinerz, Mathias Widbiller, Claude Niederle, Marc Geserick, and Dirk Nolte

Introduction: After third molars, canines are the teeth most commonly affected by displacement and impaction. Although orthodontic surgical treatment represents the standard method for repositioning canines, autotransplantation (autTX) functions as the second-line therapy if orthodontic alignment does not succeed in treating impacted and severe displacement. This retrospective cohort study aimed to identify clinical predictors for postoperative survival and endodontic treatment needs after autTX of severely displaced and impacted canines. **Methods:** The study cohort comprised patients who received canine autTX in a single surgical session between 2006 and 2018. Canines with severe displacement and retention were surgically treated using a standardized protocol. Statistical analysis of survival probability was performed with the Kaplan-Meier method, and bivariate data were analyzed using logistic regression and the Pearson chi-square test. Nonparametric continuous variables were analyzed using the Mann-Whitney U test. **Results:** Data from 319 patients with 378 canine grafts were available for analysis after a mean follow-up of 54.7 ± 30.5 months on the patient level (range, 0.3–181.6 months) with 25 lost autotransplants; the cumulative survival rate was 93.4%. Patient age at surgery, the state of the apical foramen, endodontic treatment need, and persistence of deciduous teeth at the implantation site had a significant negative impact on autotransplant survival (P < 0.05). Endodontic treatment need was significantly related to the patient's age at surgery, the state of the apical foramen, and preoperative orthodontic factors (P < 0.05). Thus, these independent variables were identified as critical predictors for the survival of both the autotransplant and the dental pulp. Gender, ischemia time, postoperative antibiotic, or site of autTX did not influence any of the outcome variables. **Conclusions:** The high survival rates of autotransplanted permanent canines make this treatment a promising option, especially in patients with severe tooth displacement, in which orthodontic treatment alone cannot provide predictable alignment. Inspection of the patient's age, interpreting age and preoperative orthodontic factors as delaying the onset of autTX, and state of apex, time-dependent aspects seem to be of great importance for postoperative complications leading to endodontic treatment or graft loss. Therefore, early implementation of autTX as a treatment modality for impacted, severely displaced, and non-erupted canines in daily surgical practice should be encouraged. (Am J Orthod Dentofacial Orthop 2024; ■ ■ ■)



Krupp, J., Petrakakis, P., Jost-Brinkmann, P.G., Meinerz, S., Widbiller, M., Niederle, C., Geserick, M., and Nolte, D. (2024). Survival of retained permanent canines after autotransplantation: A retrospective cohort study. American journal of orthodontics and dentofacial orthopedics 10.1016/j.ajodo.2023.11.011.



Schwierige KFO-Fälle erkennen und behandeln (lassen)

- Verlagerte 3er
- Frontaler Kreuzbiss
- Nichtanlagen

Prävalenz des Kreuzbisses

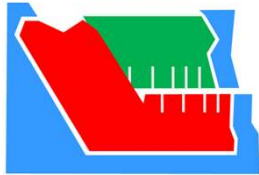
Systematische Übersichtsarbeit (De Ridder et al. 2022)

... liegt bei etwa 5 % der gesunden Kinder und Jugendlichen in Europa.

Continent	Crossbite (Not Specified)	Posterior Crossbite (Not Specified)	Posterior Crossbite Unilateral	Posterior Crossbite Bilateral	Anterior Crossbite	Scissor Bite	Force d Bite/Crossbite with Frontal/Lateral Shift
Africa	1.2 ± 0.0% *	5.5 ± 2.8%	5.5 ± 0.0% *	1.6 ± 0.0% *	5.5 ± 1.9%	10.3 ± 4.8%	14.7 ± 10.3%
America	NA	9.3 ± 6.3%	13.0 ± 1.2%	3.8 ± 1.4%	4.9 ± 3.9%	1.0 ± 0.6%	NA
Asia	8.9 ± 14.0%	6.6 ± 7.0%	5.0 ± 2.1%	5.0 ± 1.0%	10.3 ± 6.5%	1.8 ± 1.6%	11.9 ± 4.8%
Europe	5.1 ± 2.9%	8.9 ± 4.3%	8.6 ± 1.8%	1.6 ± 1.1%	5.6 ± 4.0%	1.0 ± 1.5%	13.7 ± 5.5%
Oceania	NA	NA	13.0 ± 0.0% *	6.5 ± 0.0% *	12 ± 0.0%	NA	NA

De Ridder, L., Aleksieva, A., Willems, G., Declerck, D., and Cadenas de Llano-Perula, M. (2022). Prevalence of Orthodontic Malocclusions in Healthy Children and Adolescents: A Systematic Review. Int J Environ Res Public Health 19. 10.3390/ijerph19127446.

FRÜHBEHANDLUNG BEI KLASSE III



Prominenz vom Unterkiefer: Klasse III

S3-Leitlinie "KFO-Behandlungszeitpunkt"
Langversion
Dezember 2021

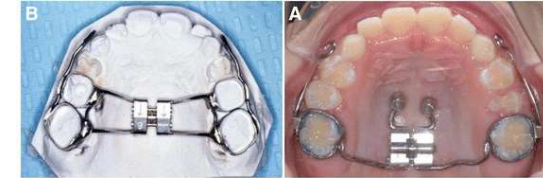
7.3 Schlüsselfrage 4 – Kieferorthopädische Früh- vs. Regel-/Spätbehandlung

Empfehlung 16: Idealer Behandlungszeitpunkt der Klasse-III-Anomalie		
Die Therapie einer skelettalen bzw. dentalen Klasse-III-Anomalie sollte frühzeitig, zum Beispiel in der frühen Wechselgebissphase, begonnen werden. Zudem gibt es Hinweise, dass bei einer Klasse-III-Anomalie eine frühe Behandlung die Notwendigkeit eines operativen Eingriffs zur Korrektur der Anomalie reduziert.	starker Konsens	B
Abstimmung: 19/0/0 (Ja, nein, Enthaltung)		
Literatur: (Baccetti et al. 2000a; Baccetti und Tollaro 1998; Baccetti et al. 1998; Franchi et al. 2004, 1998; Mandall et al. 2016; Toffol et al. 2008; Tränkmann et al. 2001; Wendi et al. 2017; Yavuz et al. 2009)		
Evidenzgrad: 1+		

S3-Leitlinie: "Ideale Behandlungszeitpunkte kieferorthopädischer Anomalien." 083-038, A.-R. (Stand: 17.12.2021, gültig bis 16.12.2026)

Digitale Konzepte für Diagnostik, Planung und Therapie Mehrwert an Patientenversorgung (UPDATE 1: Delaire Maske mit Hybrid-GNE)

Effekt Delaire mit GNE (klassisch) vs Hybrid-GNE



GNE (klassisch)
Mesialwanderung & OK FZ-Proklination

Hybrid-GNE
Kaum Mesialwanderung OK 6er



Hybrid-GNE... vorteilhafter, kaum dentale Nebeneffekte

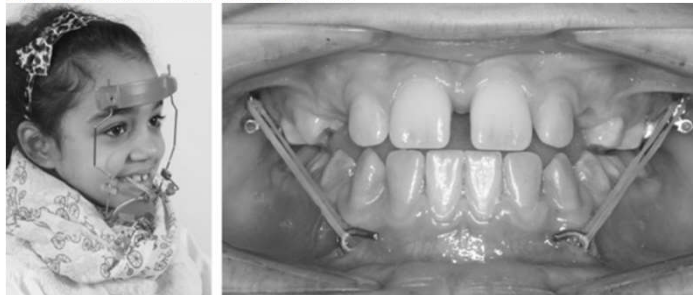
Ngan, P., B. Wilmes, D. Drescher, C. Martin, B. Weaver and E. Gunel (2015). "Comparison of two maxillary protraction protocols: tooth-borne versus bone-anchored protraction facemask treatment." *Prog Orthod* 16: 26

Digitale Konzepte für Diagnostik, Planung und Therapie Mehrwert an Patientenversorgung (UPDATE 2: Alternative zu Delaire Maske)

Vergleich Hybrid-Hyrax+Delaire mit Hybrid-Hyrax+Mentoplate

Early Class III treatment with Hybrid-Hyrax - Facemask in comparison to Hybrid-Hyrax-Mentoplate - skeletal and dental outcomes.

Willmann_JH¹, Nienkemper_M^{2,3}, Tarraf_NE⁴, Wilmes_B¹, Drescher_D¹.

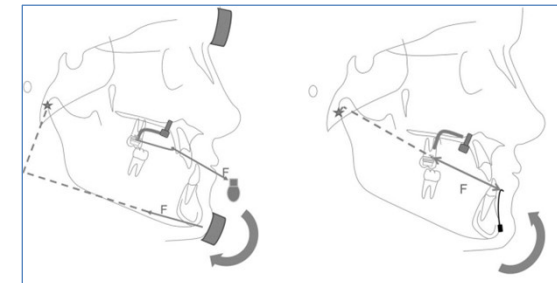


Willmann, J. H., M. Nienkemper, N. E. Tarraf, B. Wilmes and D. Drescher (2018). "Early Class III treatment with Hybrid-Hyrax - Facemask in comparison to Hybrid-Hyrax-Mentoplate - skeletal and dental outcomes." *Prog Orthod* 19(1): 42.

Digitale Konzepte für Diagnostik, Planung und Therapie Mehrwert an Patientenversorgung (UPDATE 2: Alternative zu Delaire Maske)

Vergleich Hybrid-Hyrax+Delaire mit Hybrid-Hyrax+Mentoplate

Beide Gruppen:
SNA +2,2°
WITS +4mm
OK FZ Inklination stabil



HybridHyrax + Delaire: ML-NL: +1,86° NSL-ML: +1,17° SNB: -0,3°
HybridHyrax + Mentoplate: B-Punkt bleibt stabil, vertikale Kontrolle

Willmann, J. H., M. Nienkemper, N. E. Tarraf, B. Wilmes and D. Drescher (2018). "Early Class III treatment with Hybrid-Hyrax - Facemask in comparison to Hybrid-Hyrax-Mentoplate - skeletal and dental outcomes." *Prog Orthod* 19(1): 42.

Digitale Konzepte für Diagnostik, Planung und Therapie
Mehrwert an Patientenversorgung (UPDATE 3: Alternative zu Mentoplate)

OK- & UK-Hybrid-Verankerung für Kl. III Gummizüge

Fallbeispiel:

11 Jahre
 Zst. nach GNE + Delaire
 Rezidiv mit negativen Overjet nach 2 Jahren



Gera, S., P. M. Cattaneo, L. E. Hartig and M. A. Cornelis (2021). "Computer-aided design and manufacturing of bone- and tooth-borne maxillary protraction with miniscrews and Class III elastics: Can we contemporize Class III treatments in growing patients?" *Am J Orthod Dentofacial Orthop* 159(1): 125-132.

Digitale Konzepte für Diagnostik, Planung und Therapie
Mehrwert an Patientenversorgung (UPDATE 3: Alternative zu Mentoplate)

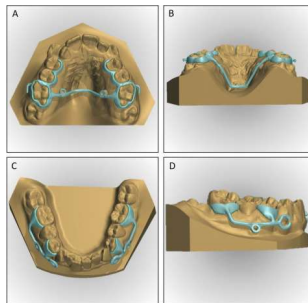
OK- & UK-Hybrid-Verankerung für Kl. III Gummizüge



Gera, S., P. M. Cattaneo, L. E. Hartig and M. A. Cornelis (2021). "Computer-aided design and manufacturing of bone- and tooth-borne maxillary protraction with miniscrews and Class III elastics: Can we contemporize Class III treatments in growing patients?" *Am J Orthod Dentofacial Orthop* 159(1): 125-132.

Digitale Konzepte für Diagnostik, Planung und Therapie
Mehrwert an Patientenversorgung (UPDATE 3: Alternative zu Mentoplate)

OK- & UK-Hybrid-Verankerung für Kl. III Gummizüge



Gera, S., P. M. Cattaneo, L. E. Hartig and M. A. Cornelis (2021). "Computer-aided design and manufacturing of bone- and tooth-borne maxillary protraction with miniscrews and Class III elastics: Can we contemporize Class III treatments in growing patients?" *Am J Orthod Dentofacial Orthop* 159(1): 125-132.

Digitale Konzepte für Diagnostik, Planung und Therapie
Mehrwert an Patientenversorgung (UPDATE 3: Alternative zu Mentoplate)

OK- & UK-Hybrid-Verankerung für Kl. III Gummizüge

Nach 10 Monaten



Gera, S., P. M. Cattaneo, L. E. Hartig and M. A. Cornelis (2021). "Computer-aided design and manufacturing of bone- and tooth-borne maxillary protraction with miniscrews and Class III elastics: Can we contemporize Class III treatments in growing patients?" *Am J Orthod Dentofacial Orthop* 159(1): 125-132.

Digitale Konzepte für Diagnostik, Planung und Therapie
Mehrwert an Patientenversorgung (UPDATE 3: Alternative zu Mentoplate)

OK- & UK-Hybrid-Verankerung für Kl. III Gummizüge

Nach 10 Monaten

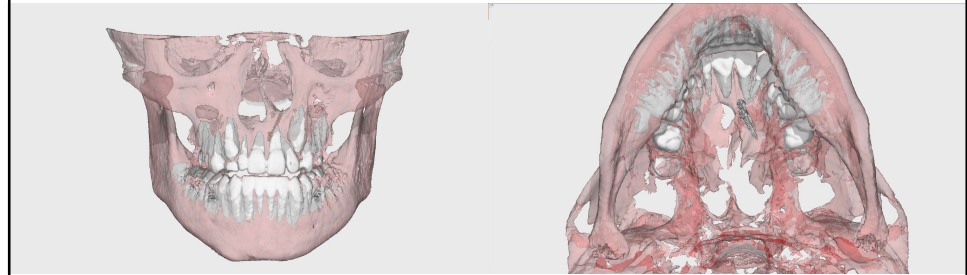


Table: Pretreatment and posttreatment cephalometric values.

Variable	Description	Pretreatment	Posttreatment
Sagittal skeletal			
ANS	Sag jaw relation	-2°	3°
SNA	Max protrusion	78°	81°
SSR	Mand protrusion	79°	78°
Sagittal dentoalveolar			
Pr-N-A	Max Alv protrusion	4°	2°
CL/ME	Mand Alv protrusion	68°	64°
Is/NI	Max incisor inclination	112°	100°
IME	Mand incisor inclination	85°	88°
Vertical skeletal			
NI/MI	Vertical jaw relation	29°	28°
NS/NI	Max inclination	4°	5°
NS/MI	Mand inclination	33°	33°
Vertical dentoalveolar			
NI/OK	Max zone	10°	8°
DL/MI	Mand zone	19°	24°
Mandibular morphology			
Ar-Co-Me/MI	Beta angle	19°	18°
Ar-Co-Me	Jaw angle	132°	132°
Vertical relationships			
Wits appraisal	Wits appraisal	-5 mm	3 mm
		Wits appraisal	-5 mm 3 mm

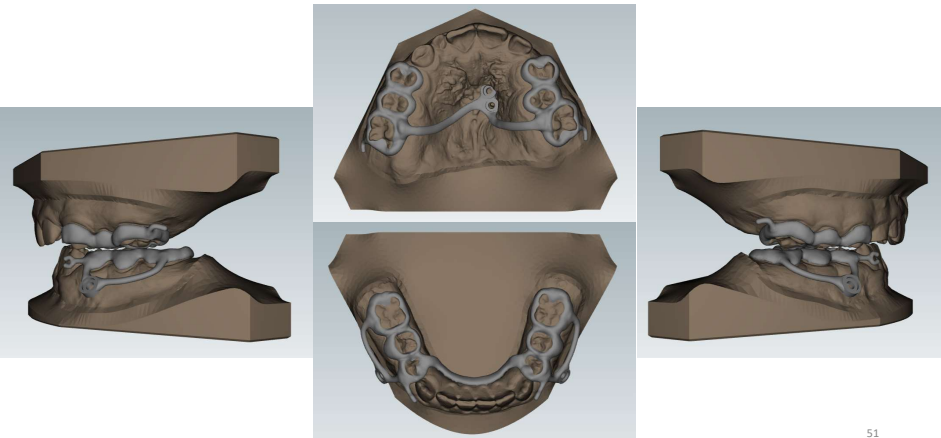
Gera, S., P. M. Cattaneo, L. E. Hartig and M. A. Cornelis (2021). "Computer-aided design and manufacturing of bone- and tooth-borne maxillary protraction with miniscrews and Class III elastics: Can we contemporize Class III treatments in growing patients?" *Am J Orthod Dentofacial Orthop* 159(1): 125-132.

Fall 5: OK/UK-Skelettale VA für intermax. Kl. III GZ



CAD/CAM-Unterstützung durch Andreas Reinhard (Klinik für Mund-, Kiefer- und Gesichtschirurgie, Ärztlicher Direktor: Prof. Dr. Dr. Jörg Wiltfang)

Fall 5: OK/UK-Skelettale VA für intermax. Kl. III GZ



Fall 5: OK/UK-Skelettale VA für intermax. Kl. III GZ



Zst. nach 10 Monaten

Şen, S., Puchert, K., and Töckelt, Ö. (2024). *Möglichkeiten der modernen Kieferorthopädie: Von der Ausgangssituation bis zur Eingliederung – Der digitale Workflow für herausnehmbare und festsitzende CAD/CAM-Apparaturen. Informationen aus Orthodontie & Kieferorthopädie* 56, 11-22. 10.1055/a-2168-8845.
 Şen, S., Puchert, K., and Töckelt, Ö. (2024). *Möglichkeiten der modernen Kieferorthopädie: Einsatzmöglichkeiten und Wirkungsweisen von CAD/CAM-Apparaturen anhand von vier Fallbeispielen. Informationen aus Orthodontie & Kieferorthopädie* 56, 23-31. 10.1055/a-2168-8908.

Digitale Konzepte für Diagnostik, Planung und Therapie Mehrwert an Patientenversorgung (UPDATE 3: Alternative zu Mentoplate)

OK- & UK-Hybrid-Verankerung für Kl. III Gummizüge

Kamel et al. Progress in Orthodontics 2023;14(1):1-8
https://doi.org/10.1007/s12282-023-00000-1

RESEARCH **Open Access**
Dentofacial effects of miniscrew-anchored maxillary protraction on prepubertal children with maxillary deficiency: a randomized controlled trial

Ahmed Mohamed Kamel¹, Sa'ad Taha Tarraf², Ahmed Maher Fouda³, Ahmad Mohamed Hafez⁴, Ahmed El-Bialy⁵ and Benedikt Wilmes⁶

Abstract
Background: The introduction of bone-anchored maxillary protraction minimized the side effects of foramen in the early treatment of patients with maxillary retrusion. This study aimed to evaluate the effects of miniscrew-anchored maxillary protraction (MAMP) appliances compared with the growth changes in an untreated control group in growing patients with Class III malocclusion.
Methods: Forty growing patients with Class III malocclusion and estrogenic maxilla were randomly allocated into two groups: treated and control groups. In the treated group, patients were treated with full-time three maxillary Class II elastics (C2) anchored by a hybrid hyrax appliance in the maxilla and a bone-supported bar in the mandible. Protraction was stopped after obtaining a desired overjet. Cephalometric radiographs were acquired before and after the treatment, and growth changes were compared between the two groups. Longitudinal comparisons were also made using analysis of covariance with the change in all variables as covariate.
Results: Forty patients agreed to participate, and 30 of them completed the study (treated group, n = 17; control group, n = 13). The average treatment duration was 11.7 months. MAMP resulted in a significant maxillary advancement of 4.45 ± 3.4 mm with significant correction over the maxillary growth. No significant increase in the mandibular plane angle was found in the treated group compared with the control group. The upper and lower incisors showed significant protraction in the treated group.
Conclusions: Within the limitations of this study and high anterior view, the MAMP protocol effectively treated maxillary forward growth with good control over the growth of the mandible anterior-posteriorly and vertically.
Keywords: Skeletal anchorage, hybrid hyrax, Class III malocclusion, Maxillary protraction



Fig. 1 A Hybrid hyrax appliance in situ. B Class II elastics were attached from the posterior hooks in the maxilla to those of the mandibular bar



Fig. 2 A Before, B with Class II elastics, and C after maxillary protraction by the MAMP protocol

Kamel, A. M., N. E. Tarraf, A. M. Fouda, A. M. Hafez, A. El-Bialy and B. Wilmes (2023). "Dentofacial effects of miniscrew-anchored maxillary protraction on prepubertal children with maxillary deficiency: a randomized controlled trial." *Prog Orthod* 24(1): 22.

Schwierige KFO-Fälle erkennen und behandeln (lassen)

- Verlagerte 3er
- Frontaler Kreuzbiss
- Nichtanlagen

Prävalenz der Nichtanlagen

Systematische Übersichtsarbeit und Meta-Analyse (Khalaf et al. 2022)

SCIENTIFIC SECTION

Journal of Orthodontics, Vol. 41, 299-316

Prevalence of hypodontia and associated factors: a systematic review and meta-analysis

Khalaf Khalaf, John Miskelly, Elena Vogt and Tatiana V. Macfarlane

University of Aberdeen Dental School and Institute, Aberdeen, Aberdeen, UK

Objectives: To determine the prevalence and factors associated with hypodontia. **Design:** Systematic review and meta-analysis. **Data sources:** A search strategy was developed along with inclusion criteria and run in MEDLINE and EMBASE (published from 2002 to August 2022) databases to reveal all studies on the prevalence of hypodontia or associated factors. A hand search of reference lists and a Google search aimed to improve the sensitivity of the literature search. **Selection criteria:** All studies on the prevalence of hypodontia or associated factors published from 2002 onwards were included. Abstracts of non-English papers were also analysed. **Data selection and extraction:** All potential articles were checked against the inclusion criteria independently, and in duplicate by two investigators. A checklist was used to assess the quality of selected studies. **Main outcome:** Prevalence of hypodontia, excluding third molars. **Results:** The overall prevalence of hypodontia was found to be 8.4% (95% CI: 5.7-12). There was a statistically significant difference in the prevalence of hypodontia by continent (CI: 0.04, P < 0.001). Prevalence of hypodontia was the highest in Africa: 13.4% (95% CI: 8.7-18.0), followed by Europe (7% CI: 5.0-8.9%), Asia (6.2% CI: 4.4-8.1%) and Australia (6.2% CI: 3.2-9.0) with a lower prevalence in North America (5.0% CI: 4.1-5.9) and Latin America and Caribbean (4.4% CI: 3.2-6.1). Females were found to have a higher prevalence than males (combined OR: 1.22; 95% CI: 1.14-1.30). The most commonly affected teeth were mandibular second premolars, followed by maxillary lateral incisors and maxillary second premolars. The prevalence of mild, moderate and severe hypodontia was found to be 81.6, 16.8 and 1.1%, respectively. **Conclusion:** There was a high variation in the prevalence of hypodontia between the studies. African populations were found to have a higher risk for tooth agenesis and there was an increased risk for females to have hypodontia than males.
Key words: Hypodontia, dental agenesis, congenitally absent teeth, prevalence, epidemiology

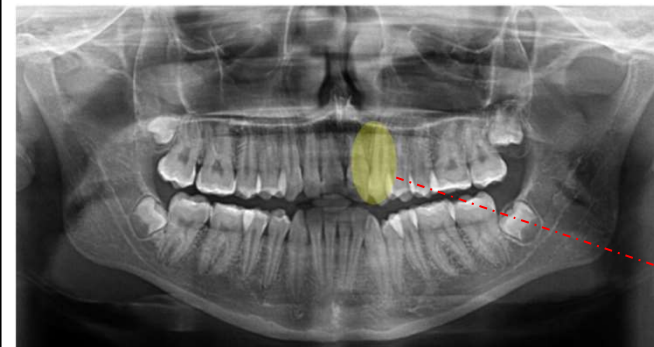
Received 25 January 2024; accepted 22 June 2024

Khalaf, K., Miskelly, J., Vogt, E., and Macfarlane, T.V. (2014). *Prevalence of hypodontia and associated factors: a systematic review and meta-analysis*. *Journal of orthodontics* 41, 299-316. 10.1179/1465313314Y.0000000116.

... liegt bei ca. 7% Kinder und Jugendlichen in EU.

Häufigkeit in Reihenfolge:
UK5er > OK2er > OK5er

Diagnostik der Nichtanlagen



UK5er > OK2er > OK5er

Meade, M.J., and Dreyer, C.W. (2023). *Tooth agenesis: An overview of diagnosis, aetiology and management*. *Jpn Dent Sci Rev* 59, 209-218. 10.1016/j.jdsr.2023.07.001.

Diagnostik der Nichtanlagen



UK5er > OK2er > OK5er

Meade, M.J., and Dreyer, C.W. (2023). *Tooth agenesis: An overview of diagnosis, aetiology and management.* *Jpn Dent Sci Rev* 59, 209-218. 10.1016/j.jdsr.2023.07.001.

Diagnostik der Nichtanlagen



UK5er > OK2er > OK5er

Meade, M.J., and Dreyer, C.W. (2023). *Tooth agenesis: An overview of diagnosis, aetiology and management.* *Jpn Dent Sci Rev* 59, 209-218. 10.1016/j.jdsr.2023.07.001.

Management der Nichtanlagen



Meade, M.J., and Dreyer, C.W. (2023). *Tooth agenesis: An overview of diagnosis, aetiology and management.* *Jpn Dent Sci Rev* 59, 209-218. 10.1016/j.jdsr.2023.07.001.

S3-Leitlinie Nichtanlagen und KFO-Lückenschluss

S3-Leitlinie (Langversion)

Zahnimplantatversorgungen bei multiplen Zahnnichtanlagen und Syndromen

Update 2021

AWMF-Registernummer: 083-024

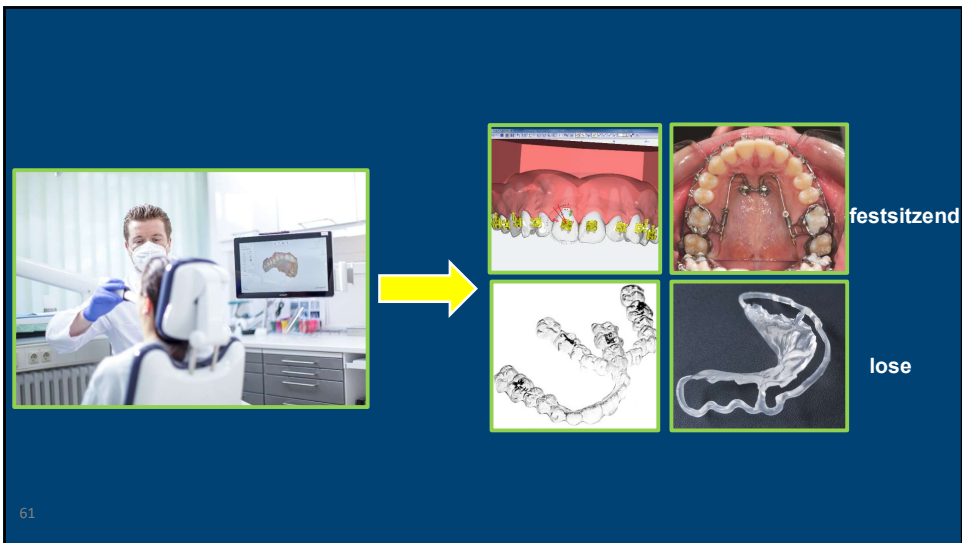
3.5 Kieferorthopädischer Lückenschluss	
Empfehlung 11	Bei Kindern und Jugendlichen, bei denen die Möglichkeit der Steuerung des Zahnwechsels beziehungsweise der Gebissentwicklung besteht, kann der kieferorthopädische Lückenschluss als primäre Therapie erwogen werden.
Empfehlungsgrad	0
Level of Evidence	2+
Konsens	Stark
+ skelettale Verankerung	



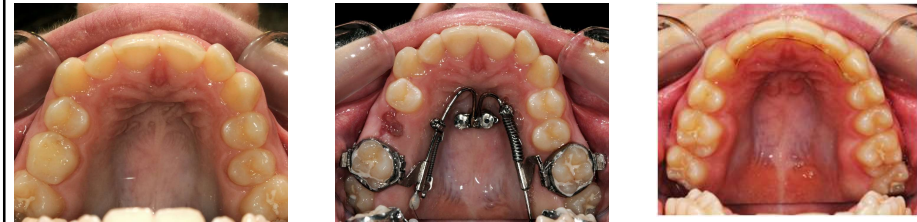
ZAHNIMPLANTATVERSORGUNGEN BEI MULTIPLLEN ZAHNNICHTANLAGEN UND SYNDROMEN
STAND DIESER S3-LEITLINIE: JULI 2019. SIE WURDE 2021 AKTUALISIERT. DIE PUBLIKATION BEFINDET SICH IN VORBEREITUNG.



S3-Leitlinie: "Zahnimplantatversorgungen bei multiplen Zahnnichtanlagen und Syndromen." Update 2021



Fall 6: Distalisation und Mesialisation im OK



Mesial- und Distalslider mit skelettaler Verankerung bei NA 15 und Engstand im 2. Quadranten

S3-Leitlinie: "Zahnimplantatversorgungen bei multiplen Zahnnichtanlagen und Syndromen." Update 2021

Zusammenfassung

- Verlagerte 3er

Diagnostik (Kontrolle Zahnwechsel, Lage, Neigung, Anatomie)

Schnittstelle Freilegung – Kommunikation KFO-HZA/Oralchirurgie - Versuch Mobilisation
Autotransplantation via CAD/CAM

- Kreuzbiss

S3-Leitlinie: Timing! Idealer Beginn 8. LJ

Maxilläre Protraktion durch Kieferorthopädie

Individuelle, Innovative und Interdisziplinäre Behandlung

- Nichtanlagen

S3-Leitlinie: LS durch KFO auch zu empfehlen, evtl. mit skelettaler Verankerung

Individuelle, Innovative und Interdisziplinäre Behandlung



Klinik für Kieferorthopädie , Campus Kiel

Individuelle Therapie | Innovative Ansätze | Interdisziplinarität

Für ALLE PatientInnen

Kontakt:

Prof. Dr. Sinan Şen
Klinik für Kieferorthopädie
Arnold-Heller-Str. 3, Haus B
D-24105 Kiel

Telefon: 0431 500-26303
E-Mail: sinan.sen@uksh.de



Vielen Dank!

Wissen schafft Gesundheit

Klinik für Kieferorthopädie