EPIDEMIOLOGICAL SURVEY OF CASES OF AVULSION IN A BRAZILIAN POPULATION OVER 20 YEARS

LEVANTAMENTO EPIDEMIOLÓGICO DE CASOS DE AVULSÃO NA POPULAÇÃO BRASILEIRA AO LONGO DE 20 ANOS

ESTUDIO EPIDEMIOLÓGICO DE CASOS DE AVULSIÓN EN UNA POBLACIÓN BRASILEÑA DURANTE 20 AÑOS

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ABSTRACT

Aim: To investigate the cases attended by the Trauma Project at Estácio de Sá University from 1999 to 2019. Methodology: A review of 1.876 medical records was conducted, identifying 425 avulsion cases. The variables studied were gender, avulsed teeth, age, and type of accident/exposure. Results: Regarding age, 279 (66%) patients were up to 15 years old; 104 (24%) were between 16 and 25; 20 (5%) were between 26 and 35; 13 (3%) were between 36 and 45; and 9 (2%) were over 45 years old. As for the cause of the accident or exposure, 72 (17%) were falls; 70 (16%) were traffic accidents; 69 (16%) were bicycle falls; 65 (15%) were sports accidents; 48 (11%) were other etiologies; 48 (11%) were children's play; 43 (10%) involved some type of violence, and 10 (2%) were work accidents. The most affected region was the upper labial region, with 92.8% of cases. Regarding the affected teeth, the upper left central incisors accounted for 252 occurrences (39.6%), followed by the upper right central incisors with 226 occurrences (35.5%), the upper right lateral incisors with 54 cases (7.8%), and the upper left lateral incisors with 50 cases (7.8%). Conclusion: It was concluded that most patients treated at the Trauma Project/UNESA with dental avulsion were male, aged 15 years or younger, and had suffered falls. This trauma mainly affected upper central incisors.

Keywords: Dental Avulsion. Epidemiology. Dental Trauma.

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RESUMO

Objetivo: Investigar os casos atendidos pelo Projeto Trauma da Universidade Estácio de Sá no período de 1999 a 2019. Metodologia: Foi realizada revisão de 1.876 prontuários, identificando-se 425 casos de avulsão. As variáveis estudadas foram sexo, dentes avulsionados, idade e tipo de acidente/exposição. Resultados: Em relação à idade, 279 (66%) pacientes tinham até 15 anos; 104 (24%) tinham entre 16 e 25 anos; 20 (5%) tinham entre 26 e 35 anos; 13 (3%) tinham entre 36 e 45 anos; e 9 (2%) tinham mais de 45 anos. Quanto à causa do acidente ou exposição, 72 (17%) foram quedas; 70 (16%) foram acidentes de trânsito; 69 (16%) foram quedas de bicicleta; 65 (15%) foram acidentes esportivos; 48 (11%) foram outras etiologias; 48 (11%) foram brincadeiras de crianças; 43 (10%) envolveram algum tipo de violência e 10 (2%) foram acidentes de trabalho. A região mais acometida foi a labial superior, com 92,8% dos casos. Em relação aos dentes acometidos, os incisivos centrais superiores esquerdos representaram 252 ocorrências (39,6%), seguidos pelos incisivos centrais superiores direitos com 226 ocorrências (35,5%), os incisivos laterais superiores direitos com 54 casos (7,8%) e os incisivos laterais superiores esquerdos com 50 casos (7,8%). Conclusão: Concluiu-se que a maioria dos pacientes atendidos no Projeto Trauma/UNESA com avulsão dentária era do sexo masculino, com idade igual ou inferior a 15 anos e havia sofrido quedas. Esse trauma acometeu principalmente os incisivos centrais superiores.

Palavras-chave: Avulsão Dentária. Epidemiologia. Traumatismo Dentário.

RESUMEN

Objetivo: Investigar los casos atendidos por el Proyecto de Trauma de la Universidad Estácio de Sá de 1999 a 2019. Metodología: Se realizó una revisión de 1.876 registros médicos, identificando 425 casos de avulsión. Las variables estudiadas fueron género, dientes avulsionados, edad y tipo de accidente/exposición. Resultados: Con respecto a la edad, 279 (66%) pacientes tenían hasta 15 años; 104 (24%) tenían entre 16 y 25; 20 (5%) tenían entre 26 y 35; 13 (3%) tenían entre 36 y 45; y 9 (2%) tenían más de 45 años. En cuanto a la causa del accidente o exposición, 72 (17%) fueron caídas; 70 (16%) fueron accidentes de tránsito; 69 (16%) fueron caídas de bicicleta; 65 (15%) fueron accidentes deportivos; 48 (11%) fueron otras etiologías; 48 (11%) fueron juegos infantiles; 43 (10%) involucraron algún tipo de violencia y 10 (2%) fueron accidentes laborales. La región más afectada fue la labial superior, con el 92,8% de los casos. En cuanto a los dientes afectados, los incisivos centrales superiores izquierdos representaron 252 casos (39,6%), seguidos de los incisivos centrales superiores derechos con 226 casos (35,5%), los incisivos laterales superiores derechos con 54 casos (7,8%) y los incisivos laterales superiores izquierdos con 50 casos (7,8%). Conclusión: Se concluyó que la mayoría de los pacientes atendidos en el Proyecto Trauma/UNESA con avulsión dental fueron varones, de 15 años o menos, y habían sufrido caídas. Este trauma afectó principalmente a los incisivos centrales superiores.

Palabras clave: Avulsión Dental. Epidemiología. Trauma Dental.

INTRODUCTION

The oral and maxillofacial region is highly exposed and, therefore, at a high risk of trauma, which can be classified as facial bone fractures, dentoalveolar trauma, and soft tissue injuries (Park *et al.,* 2015). Dentoalveolar trauma is considered a severe injury that frequently occurs in children and adolescents, with most cases being associated with emergency care. Additionally, dentoalveolar trauma can negatively impact patients' quality of life, as it can cause aesthetic, psychological, or functional damage that directly interferes with the individual's life, such as pain, occlusion sequelae, and emotional stress. This stress is often a result of potential social and psychological embarrassment, including shame in smiling, difficulty eating certain foods, and compromised hygiene (Andreasen & Andreasen, 2001; Gonçalves *et al.*, 2017; Alyahya *et al.*, 2018).

According to Zaleckiene *et al*., (2014), dentoalveolar injuries are more prevalent in permanent dentition than in deciduous dentition, mainly affecting the anterior teeth of the maxilla. The etiology and predisposing factors of these injuries are well-established in the literature and include falls, collisions with people or inanimate objects, sports activities, traffic accidents, and violence. Predisposing factors may be related to a person's anatomical characteristics, such as gender (male), pronounced overjet, Angle's Class II malocclusion, mouth breathing, open bite, short or hypotonic upper lip, and obesity. However, some injuries are iatrogenic in nature, occurring during intubation procedures under general anesthesia (Azami-Aghdash *et al.,* 2015; Galvão *et al.,* 2020).

Among traumatic dental injuries, the avulsion of permanent teeth is the most serious. The prognosis depends on the measures taken at the accident site or immediately after the avulsion. Reimplanting the tooth into the alveolus is the preferred treatment, but it cannot always be done immediately. Therefore, an appropriate emergency management and treatment plan is crucial for a good prognosis (Flores *et al.,* 2007).

Although the etiology is well-documented in the literature, the prevalence of traumatic dental injuries varies between studies conducted in different countries. Possibly, not all traumatic injuries are reported due to environmental, behavioral, and cultural differences in each location (Zaleckiene *et al.,* 2014). The impact of socioeconomic status is also discussed, with two conflicting views in the literature: some suggest a significant association between prevalence and indicators of better socioeconomic conditions, while others claim there is no such association.

However, it is known that increasing violence, traffic accidents, and greater participation of children in sports activities contribute to making dental trauma an emerging public health issue (Marcenes *et al.*, 2001; Frujeri *et al.*, 2014).

In Brazil, epidemiological studies have shown that the most vulnerable tooth to traumatic injury is the upper central incisor, involved in 80% of cases (Bastone *et al.*, 2000; Alkhadra *et al.*, 2016). According to Andreasen & Andreasen (2001), later complications such as pulp necrosis, root canal obliteration, root resorption, bone loss, and even total tooth loss are more likely when patients do not seek specialized care, particularly when the trauma does not cause pain or immediate aesthetic, psychological, or functional damage. However, specialized care immediately after trauma is essential for early diagnosis and an appropriate treatment plan, leading to a better prognosis, as established in the literature.

Dental avulsion is considered the most severe type of dentoalveolar trauma, characterized by the complete displacement of the tooth from the alveolus. It is an irreversible injury for pulp tissues (Flores *et al.*, 2007; Andersson *et al.*, 2012). Given the high frequency and severity of these injuries and the need to improve prognosis and prevention, epidemiological studies on dental avulsion are necessary to identify the most vulnerable populations and educate them on the appropriate response to such traumatic accidents. Therefore, the objective of this study was to investigate the cases attended by the Trauma Project at Estácio de Sá University – Rio de Janeiro – Brazil, from 1999 to 2019.

METHODOLOGY

The protocol for this research was submitted to the Ethics Committee of Estácio de Sá University/UNESA-RJ, approved, and registered under the CAAE opinion number 57829922.1.0000.5284.

This is a retrospective, cross-sectional, observational, and analytical study in which 1,876 medical records with complete information (detailed anamnesis and trauma history) from patients with dentoalveolar trauma treated by the Trauma Project at Estácio de Sá University were reviewed.

As an inclusion criterion, only the records of patients with dental avulsion between 1999 and 2019 were evaluated. For exclusion criteria, cases involving primary dentition avulsion, other types of dentoalveolar trauma, and incomplete records were omitted.

The variables studied were gender, the patient's age at the time of the trauma, the teeth affected during the trauma, and the type of accident/exposure.

Regarding age, the study population was divided into five age groups, according to the classification of Gassner *et al.*, (1999) based on decades of life and the available data from the sample. The groups were as follows: 15 years or younger; 16 to 25 years; 26 to 35 years; 36 to 45 years; and over 45 years.

The types of exposure were grouped into categories, including traffic accidents, violence, children's play, sports accidents, work accidents, bicycle accidents, falls and other etiologies.

The teeth affected by this type of trauma were grouped according to their counterparts as follows: upper central incisors (UCI), upper lateral incisors (ULI), lower central incisors (LCI), lower lateral incisors (LLI), and others (O), which included canines and posterior teeth.

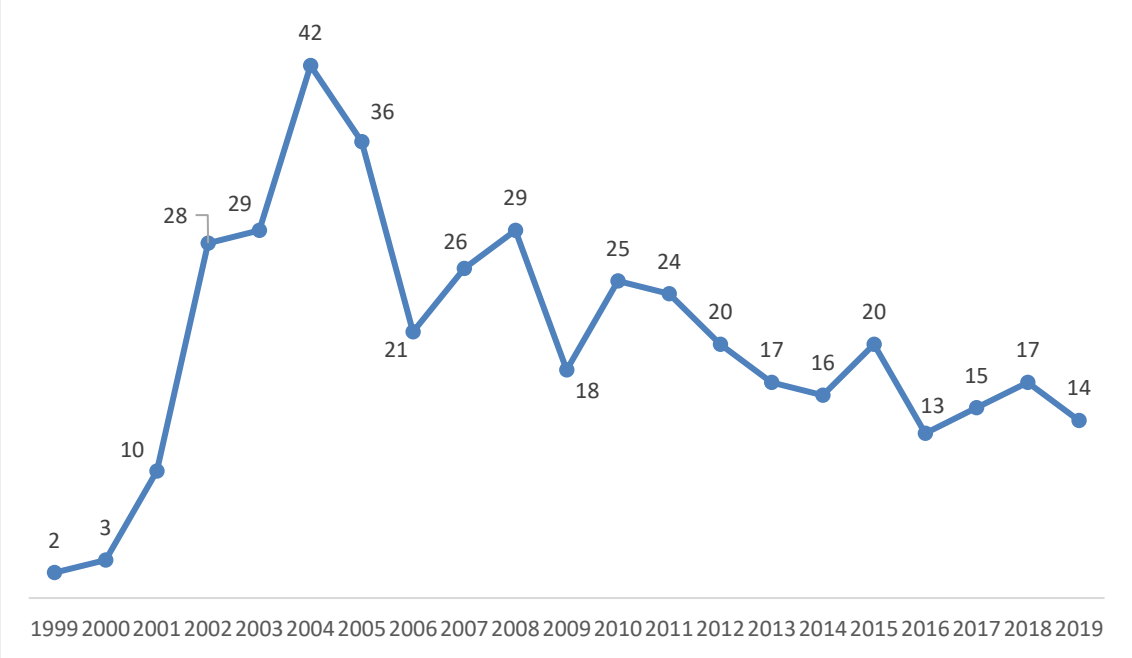
The selected data were compiled into a Microsoft Excel spreadsheet (Microsoft, Seattle, WA, USA), and the descriptive analysis included demographic characteristics. Descriptive data were obtained by calculating the frequency and percentage of the categories within each qualitative variable, while the quantitative variables were evaluated using the mean and median.

RESULTS

During the study period, 1,876 medical records were analyzed, identifying 425 cases of patients with dental avulsion. The year 2004 marked the highest peak in the historical series; however, starting from 2010, there was a slight decline in the number of cases (Figure 1).

Figure 1

Distribution of patients (n=425) treated between 1999 and 2019.



Of the total records evaluated, most patients were female. In terms of age, most patients were 15 years old or younger. The mean age of the patients was 16 years, with a mean of 15 years for males and 16 years for females. It is noteworthy that the study included patients aged between 6 and 61 years (Table 1).

Table 1

Distribution of patients (n=425) treated according to gender and age.

Age	Female		Male			
	n	%	n	%	n	%
≤15	97	35%	182	65%	279	66%
16 - 25	33	32%	71	68%	104	24%
26 - 35	7	35%	13	65%	20	5%
36 - 45	5	38%	8	62%	13	3%
> 45	5	56%	4	44%	9	2%
Total	**147**	**35%**	**278**	**65%**	**425**	**100%**

Regarding the type of accident or exposure, which are characterized as etiological factors for dental trauma, most patients suffered from a falls, followed by traffic accidents and bicycle falls. In each category, most patients were male, as shown in Table 2.

Table 2

Distribution of patients (N=425) according to gender and type of accident/exposure.

Type of accident/exposure	Female		Male		Total	%
	Total	%	total	%		
Falls	29	40%	43	60%	**72**	**17%**
Traffic accidents	24	34%	46	66%	**70**	**16%**
Bicycle falls	26	38%	43	62%	**69**	**16%**
Sports accidents	10	15%	55	85%	**65**	**15%**
Other etiologies	23	48%	25	52%	**48**	**11%**
Children's play	18	38%	30	63%	**48**	**11%**
Violence	12	28%	31	72%	**43**	**10%**
Work accidents	5	50%	5	50%	**10**	**2%**
Total	**147**	**35%**	**278**	**65%**	**425**	**100%**

The distribution of total patients according to age group and type of accident is presented in Table 3. It can be observed that the main occurrences among patients aged 15 years or younger were related to bicycle falls, children's play, and falls. For patients aged 16 to 25 years, traffic accidents and violence were predominant causes.

Table 3

Distribution of patients (n=425) according to age group and type of accident.

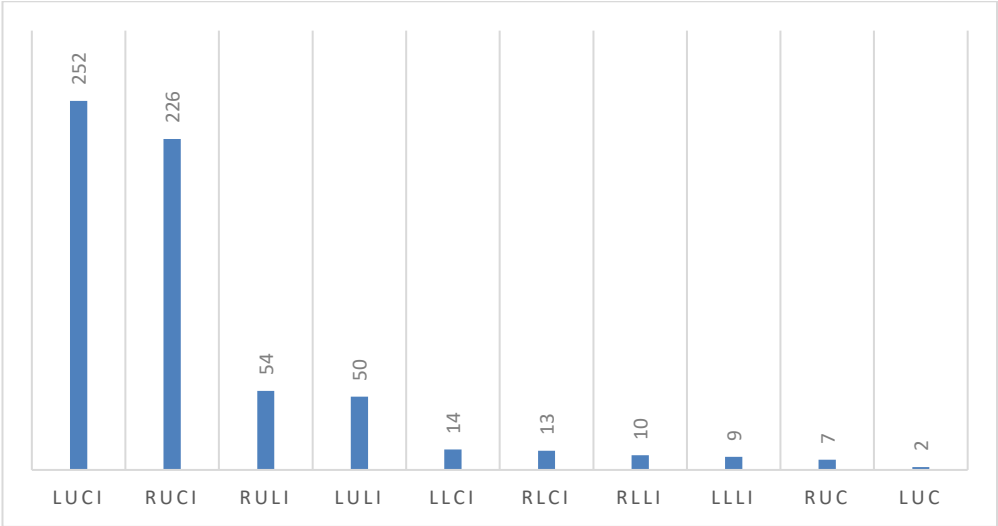
Age /	≤15		16 - 25		26 - 35		36 - 45		>45		Total	
Type of accident	n	%	n	%	n	%	n	%	n	%	**n**	**%**
Falls	47	65	13	18	4	6	5	7	3	4	**72**	**17**
Traffic accidents	26	37	32	46	6	9	4	6	2	3	**70**	**16**
Bicycle falls	57	83	6	9	4	6	1	1	1	1	**69**	**16**
Sports accidents	46	71	17	26	1	2	-	-	1	2	**65**	**15**
Other etiologies	42	88	4	8	-	-	-	-	2	4	**48**	**11**
Children's play	48	100	-	-	-	-	-	-	-	-	**48**	**11**
Violence	13	30	23	53	5	12	2	5	-	-	**43**	**10**
Work accidents	-	-	9	90	-	-	1	10	-	-	**10**	**2**
Total	**279**	**66**	**104**	**24**	**20**	**5**	**13**	**3**	**9**	**2**	**425**	**100**

Among the 425 patients analyzed, 637 avulsed permanent teeth were identified, caused by some type of accident. Of this sample, 214 (34%) teeth were from female patients and 423 (66%) from male patients. The most affected region was the upper labial area, accounting for 91.4% of cases.

The left upper central incisors (LUCI) represented most occurrences, followed by the right upper central incisors (RUCI), as shown in Figure 2.

Figure 2

Distribution of dental elements (n=637).



LUCI (left upper central incisor); RUCI (right upper central incisor); RULI (right upper lateral incisor); LULI (left upper lateral incisor); LLCI (left lower central incisor); RLCI (right lower central incisor); RLLI (right lower lateral incisor); LLLI (left lower lateral incisor); RUC (right upper canine); LUC (left upper canine).

Regarding the type of accident or exposure, the highest frequency of affected teeth was caused by traffic accidents, followed by falls, bicycle falls, and sports accidents.

When correlating the type of accident/exposure with the affected teeth, it was found that most occurrences were related to traffic accidents, with the most affected tooth being the left upper central incisor, followed by the right upper central incisor, as detailed in Table 4.

Table 4

Distribution of affected teeth (N=637) according to the type of accident/exposure and dental elements.

Dental Elements	Traffic accidents	Bicycle falls	Falls	Sports accidents	Children's Play	Other etiologies	Violence	Work accidents	Total
LUCI*	48 (7,5%)	43 (6,8%)	41 (6,4%)	33 (5,2%)	30 (4,7%)	27 (4,2%)	25 (3,9%)	5 (0,8%)	252 (39,6%)
RUCI*	43 (6,8%)	34 (5,3%)	36 (5,7%)	34 (5,3%)	25 (3,9%)	27 (4,2%)	20 (3,1%)	7 (1,1%)	226 (35,5%)
RULI*	16 (2,5%)	6 (0,9%)	8 (1,3%)	10 (1,6%)	5 (0,8%)	1 (0,2%)	3 (0,5%)	5 (0,8%)	54 (8,5%)
LULI*	16	10	8	4	2	4	5	1	50

Dental Elements	Traffic accidents	Bicycle falls	Falls	Sports accidents	Children's Play	Other etiologies	Violence	Work accidents	Total
	(2,5%)	(1,6%)	(1,3%)	(0,6%)	(0,3%)	(0,6%)	(0,8%)	(0,2%)	(7,8%)
LLCI*	4 (0,6%)	2 (0,3%)	4 (0,6%)	1 (0,2%)	-	-	3 (0,5%)	-	14 (2,2%)
RLCI*	3 (0,5%)	2 (0,3%)	3 (0,5%)	2 (0,3%)	-	-	3 (0,5%)	-	13 (2,0%)
RLLI*	2 (0,3%)	2 (0,3%)	2 (0,3%)	2 (0,3%)	-	-	2 (0,3%)	-	10 (1,6%)
LLLI*	3 (0,5%)	1 (0,2%)	2 (0,3%)	2 (0,3%)	-	-	1 (0,2%)	-	9 (1,4%)
RUC*	1 (0,2%)	- -	2 (0,3%)	1 (0,2%)	-	3 (0,5%)	-	-	7 (1,1%)
LUC*	1 (0,2%)	-	-	-	-	-	1 (0,2%)	-	2 (0,3%)
Total (%)	**137 (21,5%)**	**100 (15,7%)**	**106 (16,6%)**	**89 (14,0%)**	**62 (9,7%)**	**62 (9,7%)**	**63 (9,9%)**	**18 (2,8%)**	**637 (100,0%)**

*LUCI (left upper central incisor); RUCI (right upper central incisor); RULI (right upper lateral incisor); LULI (left upper lateral incisor); LLCI (left lower central incisor); RLCI (right lower central incisor); RLLI (right lower lateral incisor); LLLI (left lower lateral incisor); RUC (right upper canine); LUC (left upper canine).

DISCUSSION

Since avulsion is the most severe form of dental trauma, and the prognosis depends on measures taken at the accident site or immediately afterward, this study aimed to present epidemiological data on this dentoalveolar trauma in patients treated at the Trauma Project of University Estácio de Sá. These patients are referred from various public and private health services in Rio de Janeiro for emergency care.

Of the 1,876 records analyzed, 425 records of patients of both sexes, aged between 6 and 61 years, from 1999 to 2019, were selected. The majority of avulsed teeth were from male patients (65%), with the most affected age groups being 6 to 15 years and 16 to 25 years. These findings align with other studies, confirming that males are more frequently affected, possibly due to more aggressive behavior compared to females, as indicated in the literature. Additionally, the higher prevalence of avulsion in younger patients can be attributed to the greater incidence of falls, sports

accidents, and traffic accidents during this life stage, which are considered the main causes of dental avulsion.

In this study, the main etiological factors were falls from the same height, traffic accidents, bicycle falls, sports accidents, common accidents, children's play, violence, and work accidents. The primary occurrences recorded also correspond to the literature findings, where avulsion in patients aged 15 years or younger was mainly due to bicycle falls (83%), children's play (100%), and falls from the same height (65%). Conversely, traffic accidents (46%) and violence (53%) were predominant in the 16 to 25-year-old group.

Studies by Flores *et al.,* (2007), Fariniuk *et al.,* (2010) and Alkhadra *et al.,* (2016) showed that the most affected teeth were the upper permanent central incisors, corresponding to 53.2% of cases. Similarly, in this study, the most affected area was the upper labial region, with 91.4% of cases. The left upper central incisors accounted for 252 occurrences (39.6%), followed by the right upper central incisors with 226 occurrences (35.5%), the right upper lateral incisors with 54 cases (8.5%), and the left upper lateral incisors with 50 cases (7.8%).

In total, 637 avulsed permanent teeth were identified, with 214 (34%) in female patients and 423 (66%) in male patients. These results are consistent with findings from other studies such as those by Mori *et al.,* (2017), Frujeri *et al.,* (2014) and Alkhadra *et al.,* (2016).

Comparing the literature review with the results of this study on the etiology of dental avulsion in the population treated by the UNESA Trauma Project, it becomes clear that epidemiological studies are essential for public health policy makers. These authorities must develop prevention, planning, and training projects for the affected populations.

Zaleckiene *et al.,* (2014) emphasize that the prevalence of traumatic dental injuries varies between studies conducted in different countries, and not all traumatic injuries are necessarily reported, due to local environmental, behavioral, and cultural differences. Generally, the increase in traffic accidents, violence, and children's participation in sports activities, as described by Frujeri *et al.,* (2014) aligns with the findings of this study regarding avulsed teeth and their etiology.

Due to its unfavorable prognosis compared to other types of dental trauma, avulsion requires increased public awareness, including among guardians, teachers, and other health professionals, on how to respond to these unexpected severe injuries. Proper handling by a dentist is crucial in managing the emergency and post-emergency stages. However, this requires continuous professional development, as knowledge in this area is constantly evolving with new

discoveries from scientific research.

CONCLUSION

In conclusion, most patients treated at the Trauma Project/UNESA with dental avulsion were male, aged 15 years or younger, and had suffered falls. This trauma primarily affected the upper central incisors, negatively impacting the individual's quality of life.

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