Complications of oral piercing: a review of the literature and two case reports

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The practice of piercing has been used since ancient times, and nowadays is coming back in fashion among adolescents and young adults. Teenagers wearing oral piercings are frequently observed during routine examination, and there are, also, recurrent harmful consequences attributed to the devices. Unfortunately, piercings are usually placed by unlicensed individuals, lacking the appropriate anatomical knowledge, and therefore unable to provide sufficient information regarding the potential risks, especially when compared to the ones known by the patients. In this regard, the relevant legislation is frayed both vertically (that is within the framework of State and Regional competences), and horizontally (within the competences between the various regions). With the present study, through an accurate review of the literature and the description of two case reports, we underline the importance of informing both the patients and the dental professionals about the dental consequences undergoing the application of piercing. Both patients examined presented the common complications related to the application of piercing. The aim of this study is to underline the importance of being informed for both the dental professional and the person who undergoes piercing about its consequences for the whole oral system as well as the possible risks of infections and complications. We want to underline the key role of the dentist as a promoter of prevention of oral disorders as well as being able to deal with the possible complications which may occur.

Piercing is a widespread practice, especially among young people, consisting in the perforation of the skin or mucosal and underlying tissue of any part of the human body, to insert jewelry permanently. These jewels are objects of various workmanship and use various metals (sometimes decorated with precious stones) such as: surgical steel, gold, niobium, titanium and alloys (1).

The first evidence of piercing goes as far back as 2000 BC, when this practice was largely used as a form of art, or to identify group membership, or for ceremonial purposes, using objects made of stone or bone.2 Piercing nowadays is a widespread fashionable trend among young people, the majority of whom decide to get it to express their personality, for aesthetic reasons, for erotic reasons, for fashion and sometimes because they are influenced by friends. Piercings that are currently available for the oral cavity are 1) the barbell (straight, curved), a bar with two balls at the ends; 2) the labret, a bar with a fixed plate at one end, a small ball on the other; 3) the ring, closed or terminated with two balls. Several materials currently are used for the fabrication, mainly titanium, surgical steel, niobium, nickel alloys. Titanium and niobium are preferred due to the lightness and low percentages of allergic responses (2).

Piercings are trendy worldwide among young people, with an increasing popularity of tongue and lip piercing: Covello et al. (2020) in their sample,

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identified tongue and lip piercing in 64.4% of cases aged between 20-29 years, mostly in female (3). There is a lack of updated data on the prevalence in the literature: Hennequin-Hoenderdos et al. (2012) reported that the percentage of intra-oral and peri-oral piercings in the population is on average 5.2% (value ranging from 0.8% to 12%). The tongue is the most frequent site in the oral cavity, followed by the lip. Other areas may be the frenulum, the cheeks, the uvula (4-10).

The Pew Research Center in 2010 estimated that in the high schools of eight States of America, between the ages of 12 and 22, between 23% and 47% of young people showed body piercing in different sites than ear lobes.2 The results don't differ from the estimates of a study carried out at five high schools in Latina, Italy: Between 30 to 50% of young people aged between 14-22 had at least one piercing, while all those born in the year 1991 had a piercing (11-20).

The practice of piercings is not always performed by specialists, thus, in adolescents and young adults the risk of developing complications is frequent. A sample of 108 young people wearing oral piercings revealed in 96% of cases that they had post-surgical complications even if they complied with the instructions of the piercer. Several complications of tongue piercing have been reported, which, in accordance with the classification proposed by Campbell et al. (2002), can be distinguished in local or systemic, early or late. Early complications of oral piercings are frequent, mainly include pain, edema, hemorrhage, inflammatory reaction, hematoma caused by rupture of the tongue vessels, or the typical characteristics of an inflammatory state resulting in swelling and pain during chewing, swallowing and speaking. Rare complications may be galvanic electric currents occurring between the piercing device and a dental restorations, prolonged bleeding or severe infections (21-30).

Late or chronic complications are mostly topical, including traumatic injury to the teeth such as chipping, fracturing and pulp damage, gingival recessions affecting the lower incisors and periodontal damage. The severity of localized periodontal destruction increases according to years of wear and the barbell's stem length (30-33). Campbell reported that, among subjects who wore tongue piercing for at least two years, 50% of long-stem barbells users exhibited lingual recession. Moreover, among long-stem barbell users, the prevalence of lingual recession was significantly greater in the patients who wore the piercings for at least 2 years, compared to those who wore it less time (34-40).

Damage to the oral cavity is worsen by the piercing devices as they become reservoirs of periodontal bacteria. Ziebolz et al. (2019) observed the increased prevalence of potentially damaging periodontal bacteria and the possible relation with periodontal pockets. Moreover, the authors recorded an increased prevalence of potentially pathogenic periodontal bacteria.

MATERIALS AND METHODS

Review of the literature

From the review carried out on PubMed we found 13 studies on specimens involved with peri-oral piercing: the first was published in 2002 and the most recent is dated 2019.

This study evaluated the complications caused by oral piercings as well as by gender, mean age, and by anatomical site. We obtained interesting considerations. Data concerning gender showed that the sample was mostly made up of girls. The result obtained excluded the sample analyzed by Ziebolz et al. (2012) because they had a resulting group made up only by men. We confirmed what reported by Hennequin-Hoenderdos review according to which oral and peri-oral piercing were more prevalent in the female gender, but in a different way the resulting number in our review had shown a low disproportion (50,29% of female). This little variation, compared to the 4% in the mentioned article, can be seen as a development of the society. We also observed a high percentage of subjects aged between 20 and 29 years, rather than teenagers or older subjects who, although included in our study, they were not very represented. This data didn't differ from the recent study by Covello et al., in which they examined a population of 387 patients, of which 64.4% of individuals with piercing were between 20 and 29 years of age.

According to the literature, lingual piercings were more

popular when compared with lip piercings. Both are damaging for the periodontium and for the overall dental health (41-50). The piercing is a foreign body that interferes with physiological patterns in the oral cavity, causing the modification of lingual movements. It is often associated with the development of systemic and local complications that may occur at the time of insertion of the ornament, or later as a result of the healing process or jewelry accident. Campbell at al. classified the possible complications associated with piercing into early (acute) and late (chronic).

Early consequences of the insertion of the ornaments mainly include pain, swelling, edema, and consequently, difficulty in articulating words, chewing and swallowing. Such an insertion may perforate the numerous lingual blood vessels that irrigate the lingual musculature. In rare instances, it has been reported an increase in salivary flow, infections and generation of galvanic currents between the barbell and the metallic dental restoration (51-54).

Late complications are the most frequent. Mainly localized, they include damage to the periodontium such as gingival recessions, increased pocket depth, bone resorption, abnormal tooth wear, tooth chipping or cracking, tissue overgrowth at the pierced site, swallowing impairment, and ornament's embedment in the tongue.

In this study we decided to evaluate the effects of piercings on the soft tissues, confirming, as already ascertained, that the constant mechanical trauma causes gingival damage in the region of the lower central incisors (Table 2). The periodontal inflammation seems to accelerate the destruction of the oral tissues, which is increased by the presence of the piercing and by insufficient attention to oral hygiene. Ziebolz et al. confirmed that oral piercings promote the pathogenic bacterial population (Treponema Denticola, Provetella Intermedia). Moreover, the piercing material might also affect bacterial colonization by S. Oralis and E. Corrodens, with greater

Table 1. *Tongue and Lip Piercing Statistical Data*

AUTHORS	YEAR	SAMPLE (Male-Female)	MEAN AGE (range)	LOCATION (Tongue-Lip Piercing)
A.Campbell et al.	2002	52 (21F - 31M)	19 (15-34)	52 (TP)-6(TLP)
John K. Brooks et al.	2003	5(4F - 1M)	22,4 (19-25)	3(TP)-2(LP)
L. Chambrone et al.	2004	1F	19	1(LP)
R. De Moor, et al.	2005	50 (37F - 13M)	NR (12-40+)	47(TP)-8(LP)-5(TLP)
Kleser et al.	2005	43 (40F - 3M)	21	33(TP)-15(LP)-5(TLP)
T. Levin et al.	2005	389 (179F - 210M)	20 (18-24)	61(TP)-22(LP)
L. JW et al.	2006	91 (39M-52F)	25 (20-43)	91(LP)
D.Ziebolz et al.	2009	3(2F-1M)	26 (19-30)	3(TP)
F.Inchingolo et al.	2011	108(74M - 34F)	NR (14- 39)	45%(TP)-10%(LP)
D.Ziebolz et al.	2012	1884	NR (18-27)	46 (TP)
A.Plessas	2012	110(52M - 58F)	21 (18-35)	110(LP)-51(TP)
B. Bajkin	2014	1	16	1(TP)
J.Schmidt et al.	2019	18(14F-4M)	28 (21-38)	11(TP)-4(LP)-3(TLP)

F= Female; M=Male; TP= Tongue Piercing; LP= Lip Piercing; TLP= Tongue & Lip Piercing

susceptibility when the material is constituted of Teflon or Bioplast, predisposing to the development of gingivitis and periodontal destruction. Data were confirmed by the literature, in which numerous cases of diffuse gingivitis were reported. It must be added that often those who present piercings do not pay enough attention to oral care. A recent review by Covello et al. showed in 50% of those who wear piercing present insufficient oral hygiene. While comparing a group wearing lingual piercing to a control group that does not wear it, both with similar distribution of oral hygiene habits, Ziebolz et al. in a case control confirmed greater dental and periodontal damage in those wearing lingual piercing. Poor oral health, in addition to the presence of an ornament that favors the colonization of periodontal pathogenic bacteria, could increase the risk of developing periodontal disease.

Damage to the periodontum is the most commonly described oral complication, it is frequent and localized regardless of the gingival biotype. It is present with greater severity in the mandibular incisors area, contributing in particular to the development of gingival recessions at the lingual side in the mandibular central incisors (55-60). Our cases confirmed these complications for which the lingual side of the teeth is the most affected in those who wear lingual piercing, unlike the damage to the vestibular soft tissues corresponding to the location of the lip piercing of the lower lip. We have also observed the most impacted periodontal tissues were found in those with tongue piercings, compared to those wearing a labial piercing. An example is the data presented by Brooks et al. who report that 64.4% of the affected sites were in patients with tongue piecing, while the percentage of affected sites in the wearers of lip piercing was 35.7%, a lower value than the first group, but still significant. This information were confirmed by the cases of Schmidt et al. (2019), according to which the periodontal parameters of the mandibular incisors are worse when compared to the rest of the dentition. Also, Leichter et al. identified gingival recessions in the area directly opposite to lip piercing in 68.13% of patients, compared to 22.2% of patients without piercings18. Therefore, as confirmed by various authors, the main damage occurs in the area on which the piercing strikes with a mechanical harmful action. Even if the percentages, the depth of gingival recessions and the period of time for the damage to occur differ in the various studies, however, it remains a common complication in the wearers of the piercing ornament.

As for the tongue piercing, Campbell et al. first

Table II. *Tongue and Lip Piercing Complications – A Literature Review.*

AUTHORS	MEAN TIME WEARING	GR	CHIPPING	OTHER COMPLICATIONS
Campbell et al.	30 ± 24 months (range 1 day - 9 years)	LR 19,2% e increased with time and long stem. 53% of cases. VR in LP	19,2% cases	NR
Brooks et al.	27,3 months (range 2 months-9 years)	LR in TP. VR in LP. 41,31	1 case	NR
Chambrone et al.	6 months	VR 41,31	tooth abrasion	Ulceration at the FGM, deposits of dental plaque, increase in dental hypersensitivity.
DeMoor al.	12, 6 months	3/5 cases VR in LP. LR in TP	chipping in the posterior teeth	Postprocedural complications: swelling, pain, hemorrhage, infection, disturbed wound healing, eating problems and interference with speech
Kleser et al.	range 2 - 5 years	LP 80% casi VR, TP LR	NR	swelling and infection
Levin et al.	13,04 months (range 1-60 months)	21 pz in sede incisi mandibolari	NR	Swelling and bleeding
Leichter et al.	11,86 months (range 1 -86 months)	68,13% VR	NR	NR
Ziebolz et al.	7 days, 4 months, 7 years	LR in TP	NR	Chronic generalized gingivitis, swelling, demineralized enamel, pain, fibroma
Inchingolo et al.	12 +/- 4 months	25%	NR	Bleeding, perilesional edema, persistent mucosal atrophy, erythematous palatal mucosa, dentine hypersensitivity.
Ziebolz et al.	3,8 years (range 6 month-9 year)	LR in TP	93,5 % tooth damage	NR
Plessas	30,3 months (range 1-144 months)	39,70%	32,30%	Inflammation dentine hypersensitivity, increased salivary flow, taste change, generation if galvanic current, deposits accumulation. Postoperative complication: pain, chewing and speaking impairment, ornament swallowing and sever haemorrhage.
Bajkin	NR	NR	upper e lower incisor	Substantial bone loss in the mandibular incisor area
Schmidt et al.	6,7 anni (range 2 - 19 anni)	TP LR, LP VS	NR	NR

LR= Lingual Recession; VR= Vestibular Recession; TP= Tongue Piercing; LP= Lip Piercing; FGM= Free Gingival Margin; NR= Not Rated.

observed how the severity of the recession was statistically associated with the time of use and the length of the bar. The longer the length of time (years of wear) since piercing, the greater the gingival recession depth. In particular, among the group wearing the piercing from 0 to less than 2 years there were no recessions, which occurred with increasing severity in the group wearing it for 2-4 years and the one wearing it for 4 or more years.10 Also Plessas et al. organized the subjects into 3 groups based on the length of time: less than 12 months, between 12 and 36 months, greater than 36 months. They came to the same conclusion, that both the GR (gingival recession) and CAL (Clinical Attachment Level) valuesincreased with the lengthening of the wearing period.8 In addition, a patient described by Chambrone et al. with lip piercing, developed a class II gingival recession on both central mandibular incisors after 6 months of wearing the ornament but showing an early impact of piercing on the gingiva.

Long piercing barbell stems affect the prevalence of lingual gingival recession in anterior teeth more than the short ones (61-65). Extremely rare are cases of buccal gingival recession associated with tongue piercings: in literature, only Campbell et al. have encountered, in a group of 52 patients examined, 2 cases whose vestibular recession appears to be due to the device.

Regarding the possible secondary outcomes to oral piercing, the damage to the dental tissues that occurs most likely is areas of abrasion, fractures and chipping that often affect the premolars and molars. This could be the result of the ensuing habit of chewing the ornament. Plessas et al. observed a statistical association between chewing, rolling, nibbling the ornament and the presence of dental defects. Dental chipping, like gingival recession, is associated with the time factor: the longer the ornament is worn, the higher the percentage of complications.

The foreign body can be associated with tissue proliferations with formations of sarcoidal-like fibroids as a foreign body reaction. These have been encountered in two studies (. Bajkin reported a case of substantial bone destruction in the mandibular incisal area following lingual piercing (66-70).

As an intervention piercing is identified as a possible vector for the transmission of blood-borne viruses HIV, HAV, HBV, HCV, Herpes Simplex Virus, and Epstain-Barr. Serious systemic complications include meningitis, Ludwing's angina, endocarditis, temporary or permanent paralysis may rarely occur.

Piercing is often performed by operators without a license and adequate clinical and anatomical knowledge. Furthermore, often there is no regulation to guide or mandate the professional education on this matter and on better patient's protection (regulations vary with different countries and states or counties). The apprenticeship hours for the piercers are in fact variable from region to region. Frequently, those who undergo the intervention are not adequately informed of the possible risks associated with the intervention. The percentage of those unaware of possible complications in the sample analyzed by Vozza et al. corresponds to 53.7%, with a similar percentage confirmed by the study of Levin et al.

In our study, both patients were not aware of the piercer license, and both had not been informed about the dental complications; in both patients, local complications, although not systemic, occurred in the periodontal tissue.

CASE REPORTS

Case one

A 23-year-old female patient was examined during a routine dental check-up. The clinical evaluation revealed a large gingival recession (Fig. 1) affecting the central mandibular incisor #41. The patient was in good general health and in a good nutritional state, and she was a nonsmoker. She reported she had a barbell piercing performed 12 months prior and had a lip piercing, corresponding to the recession region, performed 6 months prior. The dental examination presented caries-free dentition and localized gingivitis and an advanced gingival recession affecting the incisor # 41 on the vestibular side, a clear result of the mechanical damage inflicted by the lip piercing, also associated with the general inflammatory state. Two years after this visit the patient returned for a check-up visit (Fig. 2). The gingival health had improved, and the vestibular recession of the incisor # 41 is stabilize. The patient had removed the lip piercing, but not the lingual one, confirming on one hand the possible traumatic connection with the lip piercing, and on the other hand the benefit of its removal associated with regular dental follow-up.

In dental literature, the incidence of vestibular recession due to lip piercing is a frequent occurrence,

in fact Leichter et al. (2006) described the vestibular recession in the gingival area directly opposed to the labret's inner disk in 68.13% of cases. It is probable that mechanical trauma in conjunction with inflammation contribute to the development of the recession.

Case two

A 33-year-old female patient attended an oral hygiene session. She was a nonsmoker in good general health and in a good nutritional state. The patient reported that her barbell piercing had been inserted 11 years prior. The dental examination revealed generalized gingivitis and marked lingual gingival recession at the mandibular incisors (#41, #42 and #31) (Fig. 3). The patient was a dental assistant and worked as an assistant at a dental practice. She didn't remember having received information about dental complications, or receiving an informed consent, but thanks to her profession she was aware of the possible risks and complication of piercing. Hence, she attended regularly to the follow-ups and to the dental hygiene session. The patient declined to remove the traumatic agent, regardless of the oral trauma that occurred, being aware of the complications and receiving strong recommendations to remove the piercing permanently.

DISCUSSION

It is clear that although the practice of piercing is widespread, regulations are not, being mostly regionally and unevenly applied. Whoever decides to undergo piercing should always turn to a piercer registered with the APP (Association Professional Piercer), hence someone who knows and respects the standards of hygiene, disinfection and post-

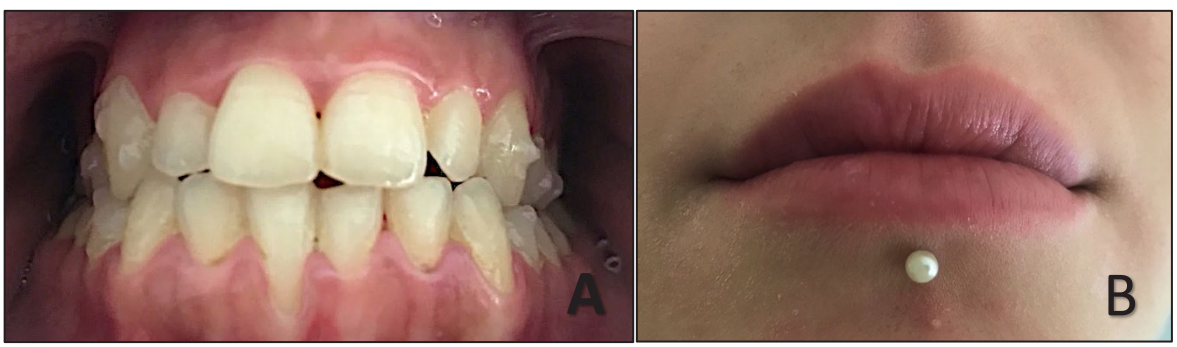

Fig. 1 *Case 1.* ***A.*** *Significant dehiscence extending to the mucogingival junction along tooth #41 attributed to the lip piercing.* ***B.*** *Perioral site of piercing along the labiomental groove.*

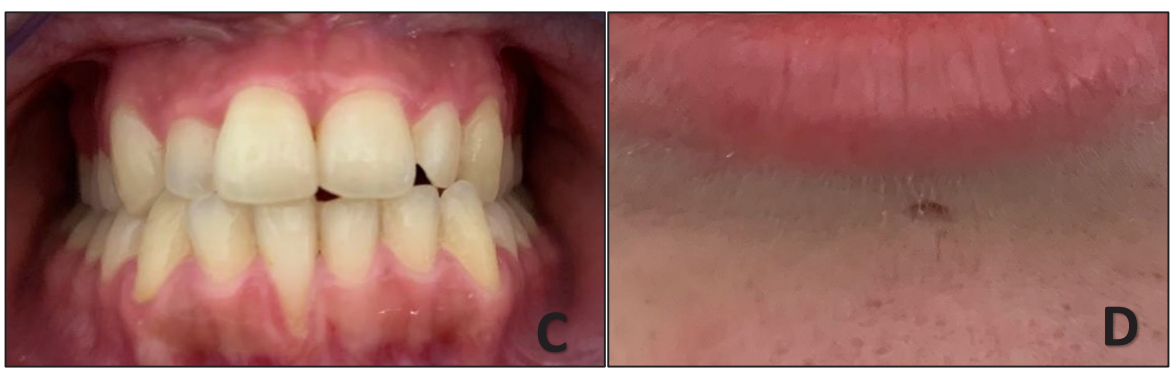

Fig. 2 *Case 1 after 2 years.* ***C.*** *Stabilization of the dehiscence along the tooth #41* ***D.*** *The piercing was removing after the recommendations.*

Fig. 3 *Case 2.* ***A.*** *Mild gingival recession along the lingual aspect of teeth #41 #42 #31. associated with tongue piercing* ***B.*** *Barbell shaped tongue piercing.*

operative instructions (mouthwash rinses, removal and bar brushing, use of antibiotic creams, post-piercing dental examination). Professional piercers have the obligation to attend a theoretical and practical training course on anatomy and foreseeable possible complications. They ought to be instructed about proper disinfection, starting from hand washing and the use of personal protection devices, as well as decontamination/sterilization of reusable instruments that can be performed with an autoclave (steam sterilization at 121° for 21 min), with dry heat (at 170° for 2 h), or at least with chemical disinfection (sodium hypochlorite at a concentration of 5000 ppm and gluteraldehyde at 2%). Too often the patient signs an informed consent that does not adequately indicate the complications, and as in the case of our two patients, despite the oral implications, patients are not warned of the dental consequences.

Unfortunately, even in regional official legislations, the model of informed consent focuses mainly on infections and wound healing problems but does not appear to indicate an explicit reference to any dental consequences (71-72).

In a study by Plessas et al. less than a third of the sample dedicated enough time to the sanitation of the ornament (8), by then it would be important to have information to avoid post-intervention infections. Considering the widespread ignorance of the complications and risk of transmission of HIV, hepatitis and bacterial infections and oral consequences, it is important to ensure that prospective clients go to facilities and contact operators who comply with all hygiene standards, creating an environment as aseptic as possible, through suitable products and autoclaves that ensure the sterilization of the used instruments.

The role of the dentists, in patients who wear piercings, is to recommend their removal if they notice problems that could damage the periodontal or dental structures and, in any case, schedule periodic check-ups. In case of infection, the dental professional should prescribe antibiotic therapy and rinses with chlorhexidine while the patient should then be closely monitored for further complications. It is possible, as in one of our cases, that the patient decides to keep the ornament as a mean of personal expression. Then the education of the young person becomes of primary importance not just regarding the need for basic oral hygiene, but also regarding how to care for the ornament, the need to wash one's hands before handling the ornament, clean the insertion area and check at least twice a day that there is no adherence at both ends of the piercing. Furthermore, it is necessary for the clinician to promote oral health as much as possible in the young person with piercing, given that attentive oral care minimizes the early and late complications caused by piercing. Covello et al. found that half of the subjects in their study was misinformed about the effects of the piercing on health; the same percentage of individuals do not disinfect the ornament; 70% of cases were unaware of the impact on the gums and 60% of them was unaware of dental consequences.

The description of the two cases confirms what

we have deduced from the literature, in terms of the frequency of the female sex getting a piercing and the incidence of periodontal damage in the mandibular incisors. Our cases confirm these complications for which the lingual side is the most affected for those who wear the tongue piercing, unlike the damaging action of the vestibular soft tissues corresponding to the location of the lip piercing of the lower lip. Confirmed by the various studies, the main damage occurs in the area on which the piercing strikes due to a mechanical damaging action, as it happened in our two patients.

Based on literature review and the clinical description of our cases, we can affirm that given the spread of this trend and the complications that can occur, both systemically and locally, it is recommended to have more frequent check-ups among patients with piercings; ensure that the disinfection and sterility guidelines of piercers are respected, and that the clients requesting a piercing are also adequately informed about possible dental consequences.

It would be appropriate that the regional legislators in the discipline of piercing activity, foresee all possible complications expressly indicated in the model of informed consent, especially in relation to the possible dental consequences (such as those examined in this paper) and to the need for periodic check-ups by the dentist.

However, the desire to wear the piercing as a way of expressing individuality is sometimes stronger than worries about their side-effects, but we as professionals must respect this need.

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