

DENTURE IMPACTION IN THE OESOPHAGUS: CORRELATION OF SITE AND DURATION OF IMPACTION WITH SEQUELAE

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ABSTRACT

Background: Denture restores aesthesis and function of missing teeth. Accidentally swallowed denture is an otorhinolaryngology emergency. The types of denture base and oesophageal anatomy influence the site of impaction.

Objective: To review site of denture impaction and factors associated with site of impaction. To correlate site and duration of denture impaction before removal with associated sequelae.

Method: A retrospective study of 27 patients managed in Otorhinolaryngology Department of University College Hospital Ibadan, Nigeria for oesophageal partial denture impaction, between August 2006 and September 2016. The demographic and clinical data of the patients were extracted from the hospital records, and statistical tables were used to illustrate the data.

Results: A total of 27 patients; 14(51.9%) males and 13(48.1%) females, (M: F, 1.1:1) were studied. The age ranged from 24 to 77 years (mean age 49.0 ± 14.2 years). Dentures were worn for 3 to 30 years (mean 3.8 ± 2.3 years) without follow-up visit to dentist and 85.2% were upper dentures. All patients had history of accidental ingestion of denture, and the mean site of impaction was 18.2 ± 3.2 cm from upper incisor, typically at upper cervical oesophagus in elderly patients and in lower oesophagus in females. There was no association between site of denture impaction, duration of denture impaction and operative findings.

Conclusion: Advanced age and female gender are associated with site of denture impaction. Late hospital presentation significantly promotes sequelae associated with management of impacted dentures. It is recommended that fundamental changes in denture designs, education on regular follow-ups and avoidance of ill-fitting dentures would reduce the prevalence of denture impaction.

Keywords: Denture impaction, Health education, Oesophagus, Oesophagoscopy and Nigeria

INTRODUCTION

Missing teeth can compromise pronunciation, chewing with associated poor quality of life.¹ The desire to restore function and aesthetic has resulted in wearing of dentures.² Etruscans was the first to make partial dentures.³ Acrylic dentures are removable teeth-replacement options which are made from a radiolucent polymethylmethacrylate material.⁴

Denture impaction in the oesophagus is a common otorhinolaryngology emergency with management challenges. Patients usually present with dysphagia, throat pain, odynophagia and pooling of saliva in pyriform sinus.⁵ Factors responsible for dislodgment of dentures from the alveolar ridge and subsequent impaction in the esophagus are: poor fit of the denture at insertion, prolonged usage, and failure of dental

clinic follow-up evaluations especially when the denture becomes loose.⁶

In addition the insulating nature of acrylic dentures reduces sensitivity of the oral cavity.⁷ The large surface area of the dentures and their pointed edges encourages impaction in the aerodigestive tract. Impacted dentures are typically found at anatomically narrow areas of the oesophagus; the cricopharyngeal sphincter⁸, the level of the aortic arch, left bronchus, left atrium and at the lower esophageal sphincter⁹.

Oesophageal denture impaction ranges between 1.3% - 38.6% in clinical practice,^{10,11} and the management outcome depends on: site of impaction, shape and size of the denture, duration of impaction, premorbid

medical conditions of the patient, the surgeon's expertise and availability of appropriate instruments, especially in resource limited countries.

Historically impacted oesophageal foreign bodies are removed through rigid esophagoscope¹², currently both flexible and rigid esophagoscopy are used for removal of oesophageal foreign bodies, with varying degree of success and mortality rates.^{13,14} Other methods includes; cervical oesophagotomy, the use of Foley's catheter under fluoroscopic guidance¹⁵ and the use of flexible esophagoscopy with polypectomy snare.¹⁶ Delay in removal of the impacted denture in oesophagus increases the risk of complications such as oesophageal obstruction, pressure necrosis, oesophageal perforation, pulmonary aspiration, sepsis and mediastinitis.¹⁷

Evaluating the local pattern of denture impaction and related sequelae will provide relevant data to boost patient-doctor communication, health promotion and public health education on the risks associated with denture and failure of routine denture evaluation at clinics.

This study evaluated site of denture impaction and likely factors responsible for impaction at those sites, it also correlated the sites of denture impaction and associated sequelae.

MATERIALS AND METHODS

A retrospective review of all patients managed for oesophageal denture impaction, in the Department of Otorhinolaryngology, University College Hospital, Ibadan, between August 2006 and September 2016.

Table 1: Clinical and socio-demographic features of the patients

Age (years)	Age(years)	Gender		Total n = 27 (100.0%)
		Male n = 14 (51.9%)	Female n = 13 (48.1%)	
	20-30 yrs	1 (3.7%)	0 (0.0%)	1 (3.7%)
	31-40yrs	1 (3.7%)	7 (25.9%)	8 (29.6%)
	41-50yrs	3 (11.1%)	1 (3.7%)	4 (14.8%)
	51-60yrs	2 (7.4%)	2 (7.4%)	4 (14.8%)
	61-70yrs	4 (14.8%)	3 (11.1%)	7 (25.9%)
	70-81yrs	3 (11.1%)	0 (0.0%)	3 (11.1%)
Socioeconomic status p = 0.135	Low	6 (22.2%)	10 (37.0%)	16 (59.3%)
	Middle	7 (25.9%)	3 (11.1%)	10 (37.0%)
	High	1 (3.7%)	0 (0.0%)	1 (3.7%)
Type of denture p = 0.02	Upper	10 (37.0%)	13 (48.1%)	23 (85.2%)
	Lower	4 (14.8%)	0 (0.0%)	4 (14.8%)
Duration of usage of denture without visit to dentist	≤10 years	6 (22.2%)	4 (14.8%)	9 (37.0%)
	11-20 years	2 (7.4%)	1 (3.7%)	3 (11.1%)
	21-30years	2 (7.4%)	0 (0.0%)	2 (7.4%)
	Duration not stated in the hospital record	4 (14.8%)	8 (29.6%)	12 (44.5%)
Distance of impaction to upper incisors (cm) p = 0.04	16cm	3 (11.1%)	0 (0.0%)	3 (11.1%)
	18cm	2 (7.4%)	0 (0.0%)	2 (7.4%)
	20cm	4 (14.8%)	7 (25.9%)	11 (40.7%)
	22cm	3 (11.1%)	2 (7.4%)	5 (18.5%)
	24cm	0 (0.0%)	1 (3.7%)	1 (3.7%)
	25cm	2 (7.4%)	0 (0.0%)	2 (7.4%)
	26cm	0 (0.0%)	1 (3.7%)	1 (3.7%)
	30cm	0 (0.0%)	1 (3.7%)	1 (3.7%)
	32cm	0 (0.0%)	1 (3.7%)	1 (3.7%)

The hospital records of the patients were retrieved, socio-demographic and clinical data were extracted. The clinical information included duration of denture impaction before presentation, the radiographic findings, surgical operation findings, status of the oesophageal mucosa after denture extraction, duration of hospital stay after surgical intervention, and the management outcome. The socio-economic status was determined by using the patient's occupation, and the pensioners were classified based on their last job before retirement.¹⁸ The data was analysed using IBM-SPSS 20 and results were presented in descriptive forms using tables. Statistical significance was set at $p < 0.05$

RESULTS

There were 27 patients with denture impaction, 14(51.9%) males and 13(48.1%) females, with M: F ratio of 1.1:1. The age of the patients ranged from 24-77years (mean age 49.72 years \pm 14.2) and 16(59.3%) of them were from low-socioeconomic class as shown in table I. The majority 15(55.5%) of the patients presented within 48hours of denture ingestion, and a patient presented after 6 weeks of denture impaction. The dentures had been worn for a

period of 3 to 30 years (mean 3.8 \pm 2.3years) without follow-up visit to dentist (Table 1). All the patients had history of accidental ingestion of the partial dentures, throat pain, and dysphagia at presentation. Plain soft tissue radiograph of the neck showed air entrapment and increased pre-vertebral soft tissue shadow in 19 (70.4%) of the patients, while the dentures were confirmed at surgery in 8 (29.6%) cases. The impacted dentures were at 16-32 cm from upper incisor. Most of the dentures 11(40.7%) were impacted at 20 cm from upper incisor which is around the left bronchus, while 3(11.1%) were at the cricopharyngeal sphincter, as shown in Table 1. The findings at surgery included, pooling of saliva, hyperemic oesophageal mucosa, and oedema of oesophageal mucosal as shown in Table 2. The dentures were removed by rigid oesophagoscopy, with the aid of foreign body grasping forceps, except in two patients that had oesophagotomy and denture extraction due to failed oesophagoscopy. The number of teeth on the denture varied between 1-4 teeth, and upper denture constituted 85.2 % of the impacted dentures. The female gender was associated with distal impaction of the denture in the oesophagus ($p = 0.03$) after excluding age as a

Table 2: Site of denture impaction and the age of the participants

Age group (years)	Distance of impaction to upper incisors							TOTAL
	16cm	18cm	20cm	22cm	25cm	30cm	32cm	
21-30	0(0.0%)	0(0.0%)	0(0.0%)	1(3.7%)	0(0.0%)	0(0.0%)	0(0.0%)	1(3.7%)
31-40	0(0.0%)	0(0.0%)	2(7.4%)	2(7.4%)	2(7.4%)	1(3.7%)	1(3.7%)	8(29.6%)
41-50	0(0.0%)	0(0.0%)	2(7.4%)	2(7.4%)	0(0.0%)	0(0.0%)	0(0.0%)	4(14.8%)
51-60	0(0.0%)	0(0.0%)	2(7.4%)	0(0.0%)	2(7.4%)	0(0.0%)	0(0.0%)	4(14.8%)
61-70	3(11.1%)	0(0.0%)	4(14.8%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	7(25.9%)
71-80	0(0.0%)	2(7.4%)	1(3.7%)	0(0.0%)	0(0.0%)	0(0.0%)	0(0.0%)	3(11.1%)
Total	3(11.1%)	2(7.4%)	11(40.7%)	5(18.5%)	4(14.8%)	1(3.7%)	1(3.7%)	27(100.0%)

Table 3: Distribution of clinical findings associated with denture impaction

Clinical findings	Throat/ anterior neck pain	27(100%)
	Pooling of saliva	15(55.6%)
	Drooling of saliva	9(33.3%)
	Odynophagia	8(29.6%)
	Dysphagia	7(25.9%)
Oesophagoscopy findings	Mucosal bruises	7(25.9%)
	Mucosal rent/laceration	3(11.1%)
	Oesophageal perforation	1(3.7%)
	Hyperemia of mucosal	12(44.4%)
	Excessive secretions	19(70.3%)
	Excessive primary hemorrhages	2(7.4%)
	Oedematous mucosal	21(77.7%)

Some patients had more than one factor

confounding factor. There was no association between the level of oesophageal denture impaction and numbers of teeth on the denture ($p = 0.10$). There was no association between the duration of hospitalisation, the type of denture ($p = 0.07$), and number of teeth on denture ($p = 0.10$), but those with cervical oesophageal denture impaction had short hospital stay ($p = 0.02$). The period of hospital admission ranged from 2 days to 33 days (mean of $8.2 \text{ days} \pm 7.8$), the prolonged period of admission of 33 days in a patient was due to other medical conditions. Those in the 6th decade of life and above had short hospital stay post denture extraction ($p = 0.04$) and the denture impaction in this category of people were at the upper oesophagus (Table 3). Complications observed were mucosa lacerations 3(11.1%) and excessive primary hemorrhages in 2(7.4%) cases and oesophageal perforations in 1(3.7%). All the patients had good clinical outcome, except 1 patient that died from thromboembolism.

DISCUSSION

The age of the patients falls within the reported 21-75 years age range of patients with denture impaction in this environment.^{19,21,22} This study revealed that denture impaction was commoner in the 31-40 age groups, which is different from report by Onatai *et al*²⁰, in which the denture impaction was commoner in the 21-30 age groups. Also Adedeji *et al*²¹ reported that denture impaction is commoner in the 61-70 age groups. The reason for variation in the age groups is beyond this study, but might be related to patient's attitudes to personal health care. All the patients in the study swallowed their dentures accidentally which is similar to other reports.^{21,22} This might be due to instability of the denture due to progressive remodeling of bone or alveolar ridge resorption resulting in poor stability of the denture over time with risk of denture impaction.²³ The prevalence of denture impaction among the females (48.1%) in this study is higher than previous studies.^{21,23}

Majority of our patients had worn their dentures for a long period of time without any follow-up visits to the dentist, similar to the earlier report from this environment.²⁰ This attitude may be due to poor communication between the dentist and the patients, on the need for follow-up clinic attendants, and the likely complications that may arise if patient default from follow up appointments. Non-dental clinic follow up visit may also be due to high cost of hospital consultation fee, delays in attending to follow up patients, poor socioeconomic status of the patients and poor educational background. The provision of health insurance for all the populace will reduce individual spending on health related matters and

improve clinics attendance. The use of short messaging service (SMS) to remind patients of the clinic-appointment will improve the follow-up clinic attendant.²⁴

In this study, fifteen (55.5%) of the patients were seen within 48 hours of denture impaction, unlike 71.4% of patients that presented within 24 hours of denture impaction in the study by Adedeji *et al*.²¹ The difference in the period of presentation may be due to delay in referral to Otolaryngologist by the general practitioners who saw the patients first. In addition the variation in severity of oesophageal symptoms following denture impaction could be responsible for differences in the period of presentation at the hospital, and this was responsible for delayed presentation for up to 6 weeks by one of the patients. This finding was similar to report by Akinpelu *et al*.²²

The soft tissue neck radiograph was useful in diagnosis of oesophageal denture impaction in this study, however it cannot be simply relied upon because the dentures may not be visible in the oesophagus in some cases and may constitute a diagnostic challenge due to radiolucent materials used in dentures fabrication.²⁵ Another limitation of the soft tissue neck x-ray is that the dentures may be impacted beyond the cervical oesophagus, as it was observed in this study in which dentures were impacted in the mid-oesophagus and lower oesophagus, which were beyond the reach of cervical x-ray. Previous studies^{6,21} had reported the limitation of cervical soft tissue radiograph and the need for additional barium swallow to determine the level of oesophageal denture impaction. However barium swallow has its limitations: it coats the entire radiolucent object, thus limiting the visualization of the denture, and dentures may be mistaken for tumors in contrast studies.^{6,8,26}

Pledget of cotton wool soaked in barium and swallowed by patients can be used, instead of barium swallow to determine the level of denture impaction. The denture will arrest the descent of the pledget and thus serves as a marker of the position of the denture.⁶

Upper partial denture impactions were mostly encountered in this study similar to the report by Arigbede *et al*.¹⁹ Upper dentures are more likely to be accidentally dislodged and swallowed than lower dentures because the wide coverage in upper dentures reduces the sensation⁷, and the dislodging effect of gravity is more effective in upper denture than lower denture. Majority of the impacted dentures in this study were between the cricopharyngeal sphincter of the esophagus and thoracic inlet, a finding similar to earlier

report from our center⁶, but different from the report of Onaitai *et al*²⁰, in which majority of impacted oesophageal foreign bodies were at the cricopharynx. There was no significant association between the level of denture impaction and the number of teeth on the denture, probably due to the broad base-plates and pitched edges of the denture.

The denture impaction in upper third of oesophagus in the elderly patients in this study may be due to presence of cervical osteophytes that hindered the migration of the denture. Osteophytes occurs with advancing age and mechanical compression of oesophagus or hypopharynx, by anterior cervical osteophytes is possible.^{27,28,29} Osteophytes can also cause obstruction by precipitating an inflammatory reaction around the oesophagus or a compression neuropathy.³⁰ Osteophytes often occurs in males between C3- C6 than females.³¹ This gender difference may account for denture impaction at a lower level in females than males. After excluding age as a confounding factor the female gender was statistically significantly associated with distal impaction of the denture in the oesophagus. Another factor for the gender differences for the site of denture impaction may be due to increase contractility and peristaltic movement in females' oesophagus compare to the males, which may propelled the dentures further into distal oesophagus. Dantas *et al*³² has reported that the duration of oesophageal contractility is greater in females than males.

High successful extraction rate (92.5%) of impacted denture with rigid oesophagoscopy was observed in this study which is similar to previous reports.^{6,21} Oesophagotomy, an open surgical approach in the oesophagus is needed if there is failed oesophagoscopy, and two of the patients had this procedure after failed esophagoscopy due to the degree of impaction, oesophagoscopy can also fail if the foreign body is inadvertently dislodged into the stomach.

The complication rate observed (22.2%) in this study is lower than 85% reported by Adedeji *et al*²¹ and higher than the earlier report of 8.7% from our center.⁶ The dissimilarity in the rate of complication may be due to the differences in the site of denture impaction in the oesophagus and the expertise of the attending surgeon. Complications were observed in patients that had oesophageal denture impaction in middle third and lower third of esophagus, while those with denture impaction in the upper part of oesophagus had short hospital stay with negligible complications. All complications were successfully managed conservatively. The patients with late hospital presentation had more complications ($p = 0.02$), similar to previous

report.^{20,33} This is probably due to pressure effect of the impacted denture on the oesophagus leading to pressure necrosis or mucosal oedema which can cause poor visualization of the denture with greater risk of iatrogenic injuries to the oesophagus.

Mortality was recorded in a patient on the fifth day post extraction of the denture, due to thromboembolism, its therefore important that early ambulation should be encouraged post operatively and appropriate cautions should be taken in patients preoperatively and post-operatively to prevent mortality or morbidity. A limitation of this study is its retrospective nature, which prevents proper assessment of risk factors for accidental swallowing of the denture and correlation of oropharyngeal indices to oesophageal denture impaction.

CONCLUSION

Advanced age and female gender are associated with site of denture impaction. Late hospital presentation significantly promotes sequelae associated with management of impacted dentures. It is recommended that fundamental changes in denture designs, education on regular follow-ups and avoidance of ill-fitting dentures would reduce the prevalence of denture impaction.

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