https://doi.org/10.25130/tjds.4.2.2

Tikrit Journal for Dental Sciences 4 (2016) 90-102

Avoiding the Impacted Supernumerary Teeth Complications by Its Early Evaluation, Using Dental Three Dimensional Computed Tomography

Nazhat M. Abdlkareem. (1)

Key words
3d CT, sapemumerary, impaction.

Abstract

Early diagnosis of unerupted supernumerary teeth is very important. Detailed examinations and evaluations of these teeth with Three-Dimensional (3D) images are very beneficial in terms of treatment planning and avoiding complications, which may occur. 3D imaging in Dentistry offers many advantages with respect to diagnosis and treatment planning. The applications of software-3DCT images for detailed evaluation of impacted supernumerary teeth: location, number, morphology and positional area, to avoid their possibility complications by early choosing the proper surgical treatment. A descriptive study including 98 unerupted supernumerary teeth from 75 healthy patients between 10 and 43 years of age. Reasons for patients attendance included : malocclusion ,lack of eruption of permanent teeth ,prominence of gingival ,diastama, ,cystic lesion, caries and pain in different regions of dental arches, taking into account the variables of personal data, gender, age, location, morphology, number and positional area, related complications,3DCT scans study and correlated with surgical approaches and treatment. Incidence in impacted supernumerary teeth is higher among male patients (ratio M: F of 1.8:1) .They are most frequently located in the maxilla (64.28%) mainly in the premaxilla within the central incisors – mesiodens (40.82 %) were detected by 3DCTscans ,most of them classified under Type III (72.5%). Most cases present only single unerupted supernumerary teeth (77.33%). The conical shape is the commonest morphology (34.69%).The diastema registered the greatest proportion (40.81%) of complications cases .Surgical removal of these teeth was done by labial or buccal approaches in (45.91%) of cases. 3DCT radiographies achieved to diagnosis and determine the exact situations, identified morphology, determined number presented and determined the position types of whole impacted supernumerary teeth that they were proved surgically to be in the same locations, similar shapes, right number and correct anatomical positions. With less invasive surgical interventions and less operation time. Early treatment planning of the impacted supernumerary teeth, the exact diagnosis of anatomical location, shape, number, position of mentioned teeth is an important issue to avoid their complication in the future.

(1) Lecturer, Department of Oral and Maxilliofacial surgery, College of Dentistry, Al-Mustansiyria University.

Introduction:

Image diagnostic exams have improved in the last decades. Modern technology involved radiation, wave reflection and electromagnetic fields, as well as computer resources that have contributed to more precise image acquisition. Image diagnosis is useful in Medicine, and Dentistry and further research has been performed to justify its application in new area. (1).

Helicoidal CT presents an image diagnostic method producing more precise 3D image of anatomic structures without superimposition, and preserving soft tissue detail.(2), and cuts in real size, showing precise teeth position and their relation to adjacent anatomic structures(3). This technique can be applied to examine impacted and supernumerary teeth before surgical and orthodontic treatment. (4)

Dental CT allows for the reconstruction of panoramic and transversal images to the maxillary and mandibular arches for any distance selected (5).

Supernumerary teeth have been defined as a developmental disturbance, producing execs of teeth. This alternation occurs during the formation of the dental germs in initiation period ,when the cells present multiplication activity, Supernumerary teeth can be formed by hyperactivity or remains of the dental lamina or even by division of the developing germ (6).

Exact etiology of Supernumerary teeth still remain unclear and several theories to explain this pathology has been proposed : local and independent hyperactivities in dental lamina ,theory is the most widely accepted(7), in which the lingual extension of an additional tooth bud forms aeumorphic tooth , while the rudimentary form arises from proliferation of the epithelial remains of dental lamina induced by dentition pressure (8) horizontal proliferation or hyperactivity of permanent or deciduous dental lamina (9).

Germ dichotomy theory where the dental lamina was divided into 2 parts of equal or different sizes, giving rise to two teeth of equal length or one normal tooth and adysmorphic one (8). Through not widely accepted ,some authors hold that multiple Supernumerary teeth are part of post-permanent dentition, a theory that is gaining ground in Thesleff studies ,in which ectodine has been described as a third dentition inhibitor protein(10), moreover, heredity is believed to be an important etiological factor in the occurrence of Supernumerary teeth. Many published cases of Supernumerary teeth mentioned recurrence within the same family (11).

Supernumerary teeth are more frequently in man than in women (12). In addition there is a greater incidence in patients suffering cleidocranial dysplasia and Gardener s syndrome, and in patient s suffering lip and palatal fissure (13). In these cases Supernumerary teeth often appears in multiple forms. Multiple Supernumerary teeth that are not related to any syndrome or systemic illness, are very uncommon (6) (14) in these patients they are normally found in inferior premolar zone (15).

Recently tooth abnormalities have become an important point in dentistry. Care should be taken in order to determine the tooth abnormalities. There are varying abnormalities, Therefore they classified according to their number, size, shape and structures (16) location and morphology, orientation. (8) (17)

The most frequent location is in the maxilla, the anterior medial region (mesiodens, where 80% of all Supernumerary teeth are found (18) ,more rarely, then can be located in superior distomolar zone, inferior premolar, superior premolar, inferior distomolar, superior canine zone and inferior incisor (19), variation in shape consist of conical types, tuberculate types, supplemental teeth and odentomas, Supernumerary teeth may therefore vary from simple odentomas, through a conical or tuberculate tooth to, supplemental tooth which closely resembles a normal tooth, also the number of Supernumeraries can greatly vary. Supernumerary teeth can appear alone or in multiple in any zone of maxilla or mandible and can manifest in various forms and directions as vertical, inverted and transverse (20).

Supernumerary teeth can erupt or remain unerupt ed and due to their shape and

volume they often hinder eruption and development of the permanent teeth related to them[21] or causing ectopic eruption[1]. Other Supernumerary teeth causing crowding, displacement, abnormal diastema, retention, pathological root resorption and in some cases causing dentigerious cyst formation [22]. In other cases Supernumerary teeth are asymptomatic and are diagnosed in radiological examinations for unrelated studies [23].

An early diagnosis and accurate interventions are extremely important for the correct evolution of dentition development. Usually the diagnosis is preformed through conventional intra and extra oral radiography (per apical, occlusal and panoramic) [24]. these traditional radiographic examinations are usually limited to 2-dimensional images [25,4].Due to superimposing structural component, these modalities don't provide sufficiently detailed information concerning [1,22] .The correct diagnosis of location of lesion is sometimes impossible with these techniques[22]. In order to situate them, three-dimensionally in relation to the adjacent structures and to make decisions about therapeutic options .Computed tomography (CT) has emerged as: a basic technique to assess patients with Supernumerary teeth [23].

Most Supernumerary teeth treatment are extracted in order to avoid possible complications, nevertheless, it is not entirely possible to ascertain the right time for surgical intervention [26]. Some authors prefer to wait for an almost complete development of adjacent permanent teeth [27]. The three-dimensional (CT) provides an image without surrounding superimposing thus facilitating the determination of the exact Supernumerary teeth location and it's distance from the cortical bone [1] and their relation to adjacent anatomical structures in real size, with less imaging time in comparison to other techniques [22,][2][3]. Three dimensional (CT) must be requested as a diagnosis complement when radiographs are insufficient to establish safe diagnosis and surgical planning [25].

Aim of study:

The aim of this descriptive study is to demonstrate the applications of software-3DCT images for detailed evaluation of impacted supernumerary teeth: location, number, morphology and positional area, to avoid their possibility complications and to eliminate symptoms by early choosing the proper surgical treatment.

Materials and method:

A descriptive study has been carried out on Eighty nine teeth from seventy five healthy patients (49 males and 26 females) ranging in age from 10 to 43 years 'who have been treated in the Oral and Maxillofacial Surgery and Orthodontic Department in AL-Mustansiryia University College of Dentistry .

Reasons for patients attendance included: malocclusion, lack of eruption of permanent teeth, prominence of gingival, diastama,cystic lesion, caries and pain in different regions of dental arches . The patients had already two-Dimensional (2D) radiographs, (per apical film, occlusal film, or orthopanaramicgraphs (OPG)

Clinically the location of all impacted supernumerary teeth were examined on dental chair intraorally by inspection the abnormal orientation of adjacent teeth and missing some of permanent teeth and palpation of labial, palatal, buccal and lingual sides of ridge in immediate area of teeth in both arches ,and filled in data research paper ,then they were referred to Dental Computed Tomography (DCT) Department .

All 3- Volumetric dentition images obtained from software CT scan procedures for our patients were done by an experienced maxillofacial radiologist in the CT department of AL-Karkh General hospital-Baghdad-Iraq, who unaware of patients physical findings.

Human bone segments of toothed jaw with 63 upper impacted supernumerary and 35 lower impacted supernumerary teeth were scanned by (Philips -Brilliance 64) 3-Dimensional (3D) Dental software multislice CT.

Image data obtained for complete dental /

maxillofacial volume with scan time vary from about 2.3-3.5 second for regional scan, thickness of slice: 0.67-1 mm, KVp: 120, mAs : 25-390 per slice.

A large field of dental software CT images be viewed in the full 360 degree range and in any desired plane -around the immediate area of interest in order to classify and evaluate the exact position of impacted supernumerary teeth and their relationships with adjacent teeth and important anatomic structure to decide which of them must be extracted and plan the surgical access.

As the 3D images were being examined the following records were evaluated in all patients: gender ,distribution of impacted supernumerary teeth according jaws maxilla or mandible, their locations, shapes, number present in region.The anatomical locationof those impacted supernumerary teeth studied was divided into six region s, depending on the relationship with the kind of tooth it would become: (mesiodens, superior premolar, superior paramolar, inferior incisor, inferior premolar and inferior paramolar) and all these teeth also determine their position within single region and were classified according to Nazhat M., et al [28] as:

1-**Type I:** crown located in the buccal or labial side.

2-**Type II:** crown located in the palatal or lingual side.

3- **Type III:** crown located in the half distance of the labio-platal or bucco--platal,labio-lingual or bucco-lingual area.

The morphology of impacted supernumerary teeth were classified into: Conical, Tuberculate, Supplemental and Mixed. And according to the number of impacted supernumerary teeth that present within the single region were classified into: single, double and 3≤.

All surgical procedures to remove 98 impacted supernumerary teeth were performed by an experienced maxillofacial surgeon through 2-sided, 3-sided, palatal and enveloped flap under loco-regional anesthesia using the chisels and forceps. The patients were prescribed antibiotic, analgesic and mouth wash for 7 days of the postoperative period and given all the other postoperative recommendations.

Statistical analysis:

SPSS Version 20 was used for data analysis. All data were loaded in to the system. Descriptive analysis was done as well comparative study between 3DCT scan and post-operative finding using Chi Square test, Alpha was set <0.05 as a significant value.

Results:

Seventy five patients with ninety eight impacted supernumerary teeth were studied. Male patients were 49(65.33%) and 26 (34.67%) female with male:female ratio 1.8:1. Patients age was ranged between 10 and 43 years with higher mean value in the females compared to males, the mean ± SD of females and males were 23± 8.857 and 21 ± 7.326 respectively (Table 1).

Clinically, the result of 2D- X rays showed that, the most frequently impacted supernumerary teeth were in maxilla n=63 (64.28%) and lesser in mandible n=35 (35.72%) with significant difference between the two regions (Figure 2).

The 3DCT scans showed six location variant types of impacted supernumerary teeth: the mesiodens were 40 (40.82%) mostly seen in both dental arches, (17.34%); (15.32%); impacted superior paramolar 12 (12.24%); superior premolar 11(11.22%), and finally inferior paramolar 3 (3.06%). The difference of the distribution in both jaws was statistically significant P = 0.012.

Table 2 Classification according to morphology using 3DCT Scan were; 34 conical shaped, 31 tuberculate, 28 supplemental and 5 mixed shaped impacted supernumerary teeth. The conical shape was the most common (34.69%), followed by tuberculate (31.63%), supplemental (28.57%) and finally the mixed shaped demonstrated the least percentage (5.11%). All these impacted supernumerary teeth were proved surgically to be the same forms as they noticed in 3DCT views. Statistically there is no significant differences between the 3DCT scans and the postoperative findings in determining the shapes of the impacted supernumerary teeth, P = 0.989.

The number of impacted supernumerary teeth present in a single segment in both arches were, 58 (77.33%) patients had single impaction 58 (59.18%), which was the highest percentage among the groups,11(14.67%) patients have 22 (22.46%) double impaction and 6(8%) have 18 (18.36%) ≥ 3, which was considered the lowest percentage among the groups. All 3DCT evaluating unerupted supernumerary teeth confirmed surgically to be true number present as assessed in 3D-radiographs. Statistically there is no significant differences between the 3DCT images and the surgical intervention findings in assessing the number present of impacted supernumerary teeth with P = 0.926 as shown in (Table 3).

According to Nazhat, M.A et al classification [30] (type I, II & III), the positions of 98 non erupted supernumerary teeth results; of 40 mesiodens detected by 3DCT, 29 (72.5%) impacted supernumerary teeth were classified under type III; 7(17.5%) type II, and 4(10%) type I. The inferior incisors impacted supernumerary teeth were 15, 3 (20%) of them were labially impacted classified as type I, 1(6.7%) lingually impacted as type II and 11(73.3%) as type III. Inferior paramolars impaction totally were3 classified as type I. All these teeth were proved surgically to be in the same locations as they observed in 3DCT views (table 4). Statically there is no significant differences between the 3DCT scans and the surgical findings with p = 0.889.

In term of complications that caused by the unerupted supernumerary teeth, initially diagnosed clinically by 2D radiographs and 3DCT scans confirmed surgically, it appears that diastema registered the greatest proportion 40(40.81%), a slightly less percentages 16(16.33%), 17(17.35%) and 14(14.28%) were recorded by delay of eruption, prominence of gingival and malocclusion or formation respectively ,which was comprised nearly the same percentages, while resorption of adjacent root and cystic lesion formation both presented the least percentages 7(7.15%) and 4(4.08%) respectively. Statistically there is no significant differences between the 3DCT views and the surgical findings in diagnosing the reasons of complications P= 0.922, as presented in (Figures 3, 4, 5, 6, 7).

Surgical removal of impacted supernumerary teeth, five possible approaches were considered including: labial or buccal, palatal, incisal, linguo-incisal and through and through flaps. Labial or buccal was found to be the main approach utilized for removing of 45 (45.91%) of impacted supernumerary teeth followed by incisal and palatal flaps 20 (20.41%) and 19(19.38%) respectively, through and through flap used to extract 11 (11.23%) of cases and finally 3(3.07%) impacted supernumerary teeth were operated by linguo-incisal approach (Figure 8).

The present study are summarized in table (5) that the dental software CT succeeded to diagnosis the exact situations, identified morphology, determined number presented and determined the position types of whole 98 (100%) impacted supernumerary teeth that they were proved surgically to be in the same locations, similar shapes, right number and correct anatomical positions.

Discussion:

Seventy five patients with ninety eight impacted supernumerary teeth were studied to evaluate the importance of 3DCT in their detection, localization and classification confirmed by surgical finding. The study resulted in a higher incidence of supernumerary teeth in male patients than female, this finding is in agreement with other studies [19][12][26][7] [23][29][30]. They reported that male patients being more commonly affected than female, male: female ratio were; Salcido-Garcia et al [30] 1.8:1; Liu et al [23] 2.64:1; Rajab and Hamdan[7] 2.2:1; Luten[31] 1.3:1 and Zilberman et al[32] 2.5:1. However; other studies found higher male to female ratio,5.5:1 for Japanes and 6.5:1 for Hong Kong children [33]; Yasof [34]found the ratio 9:2 and Lin [35] reported a 3:I ratio. This may be attributed to the racial differences or possible sampling differences.

Clinically, the result of 2D- X rays, the occurrence of supernumerary teeth in

maxilla was found to be, nearly twice that of the mandible. This result in line with other studies [23][12][26][7]. It has been reported that impacted supernumerary teeth occur more frequently in maxilla (90%) than in mandible (10%) [19][12][26][7][23][29][30]. Liu et al [23] found that the percentage of occurrence of impaction in maxilla is 97% and Sakida Garcia et al [43] found it 66%.

The 3DCT scans showed six possible locations variant types of impacted supernumerary teeth: mesiodens, superior premolar, superior paramolar, inferior incisor, inferior premolar, inferior paramolar, this finding confirmed by other study [19]. Mesiodens highlight the importance of premaxilla which are doubled the proportion of that of mandibular impacted supernumerary teeth,whereas, the inferior paramolar comprised the smallest proportion among the groups. The results mirrored the average findings obtained by other studies[7][12][23][26][29][30], they found that the most frequent location of impacted supernumerary teeth are the anterior maxilla and the mandibular premolar regions in permanent dentition however; Badin et al and Liu et al [23][37], reported that the most common location of impacted supernumerary teeth is between maxillary incisors while disagree with the result obtained by Leco et al [19], which differs significantly, this may be due to small sample size used n=21.

Classification according to the using 3DCT Scan; Our finding is coincide with other studies,Rajab and Hamadon [7], recorded that 74.8% of impacted supernumerary teeth is conical type, supported by other researches [8] [7] [23] [26] [29] [30], they stated that there are a great variety of impacted supernumerary teeth form present in permanent dentition and most common is conical shape, mostly occur in the premaxillary region. Monleregro et al [29] found that 24.20% of their sample were supplemental morphologically which is nearly resemble our result, 28.57%, however; disagree with Nazif et al [12], their results were, 48% tuberculate and 52% mixed supernumerary. Rajab and Hamdan [7], they found that 11.9% were tuberculate and 6.9% supplemental. These differences may be due to their classification included more than four types of morphology.

The number of impacted supernumerary teeth present in a single segment in both arches using 3DCT images and surgical results were in agreement with many studies [7][23][35], they found that impacted supernumerary teeth are more frequently single tooth, while multiple impacted supernumerary teeth appear frequently as two teeth.Yusof[36] stated that impacted supernumerary teeth might occur singly or multiply in any regions of the jaws and comes in agreement with Liu et al[23] study, they proved that, three dimensional scans, Cone Beam CT (CBCT) can be used routinely before the treatment of impacted supernumerary teeth, especially for those cases with multiple supernumeraries with high situation.

The distribution of impacted supernumerary teeth can glue rise to various alternations in the eruption and development of permanent teeth to which they are related as cleared in present study, therefore diagnosis, proper evaluation by 3DCT and appropriate surgical treatment are essential ,many authors agreed with our study [36][37] they mentioned that the development of impacted supernumerary teeth might precipitate a variety of complications such as, crowding, delay eruption or displacement of adjacent teeth, periodontal diseases, increased incidence of dental caries in the adjacent teeth, resorption of adjacent root teeth, malformation of adjacent teeth such as dilacerations and loss of vitality. Mitchell and Bennett [38] stated that different types of supernumeraries have been associated with different effects on the adjacent dentition. Foster and Taylor [39] examined this relationship and he found that tuberculate types are more commonly produced delayed eruption, whereas conical types more commonly displace the adjacent dentition. We understand that each case must be fully studied with multidisciplinary procedures (odontopediatry, orthodontic and oral surgery) so as to decide the prime moment for their surgical extraction. In case of

patients refusing the removal of their impacted supernumerary teeth, we recommend their presence for follow up, however they were not included in our study. This is agreed by some authors [12] [26], they recommend that most of the impacted supernumerary teeth should be treated or extracted in order to avoid possible complications. Nevertheless, it is not entirely possible to ascertain the right time for surgical intervention.

The surgical approach is an important issue, the impacted supernumerary teeth situated lingual to the tooth, and its extraction were performed safely with linguo-incisal approach without any post-operative complication. This is in agreement with [24] who concluded that the ability to accurately locate the impacted supernumerary teeth and determine their relationship with the adjacent teeth and another anatomical structure in the area is often a necessity in clinical dentistry to minimize harm and trauma to adjacent structures during extraction and determining the best surgical approach is utmost importance.

The result of this analytic study, we have highlighted the superiority of 3DCT images in detecting abilities of the impacted supernumerary teeth without superimposition of the anatomical surrounding structures and providing the surgeons with multi-planner views to design the surgical procedures without any major surgical risk, this comes in agreement with [40] [41] [3], they stated that CT images provides more detailed information about the positions of impacted supernumerary teeth and determine their inclinations bucally or palatally and their relationship with neighboring tooth which aids in designing a treatment plan without surgical risks.

Lemkamp [42] reported that once the removal of the impacted supernumerary teeth is decided, surgical plan must be carefully outlined; the choice of CT contributes in reducing the occurrence and severity of post-operative complications. Erich et al [45] stated that the clinicians confidence on the accuracy of the diagnosis and treatment plan is statistically higher for 3DCT images.Eric H, Shafaa [44] insured the ability of the 3D dental planning CT to supply the surgeon with a high resolution image of anatomical limitation, bone density with true length and width without major complications, this study comes in agreement with many studies. Murmulla et al [43] mentioned that CBCT images eliminate the superimposition of anatomical structures.Bodner et al [46] reported that the bucco-lingual dimensions cannot be produced properly by 2D radiographs without considerable superimposition of adjacent structures. Kim et al [4] said that 2D radiographs usually able to provide the required information, however these modalities do not always provide sufficient information therefor; more advanced imaging technique can on occasion, be required for optimum surgical planning.

Conclusion:

The use of dental slice three dimensional software computed tomography images has proven as a diagnostic aids, stimulating tool and useful in management of patient with impacted supernumerary teeth. It has ability to locate the precise position, anatomical shape and number of impacted supernumerary teeth providing an excellent multislice images with sufficient information in one visit with less radial exposure time and to make accurate diagnosis and design treatment strategies for oral surgeon with less invasive surgical procedures and less operation time by permits the operator to visualize the surgical anatomical area of impacted supernumerary teeth as it will be in the operation room. It seems that for early treatment planning of the impacted supernumerary teeth, the exact diagnosis of anatomical location, shape, number, position of mentioned teeth is an important issue to avoid their complication in the future.

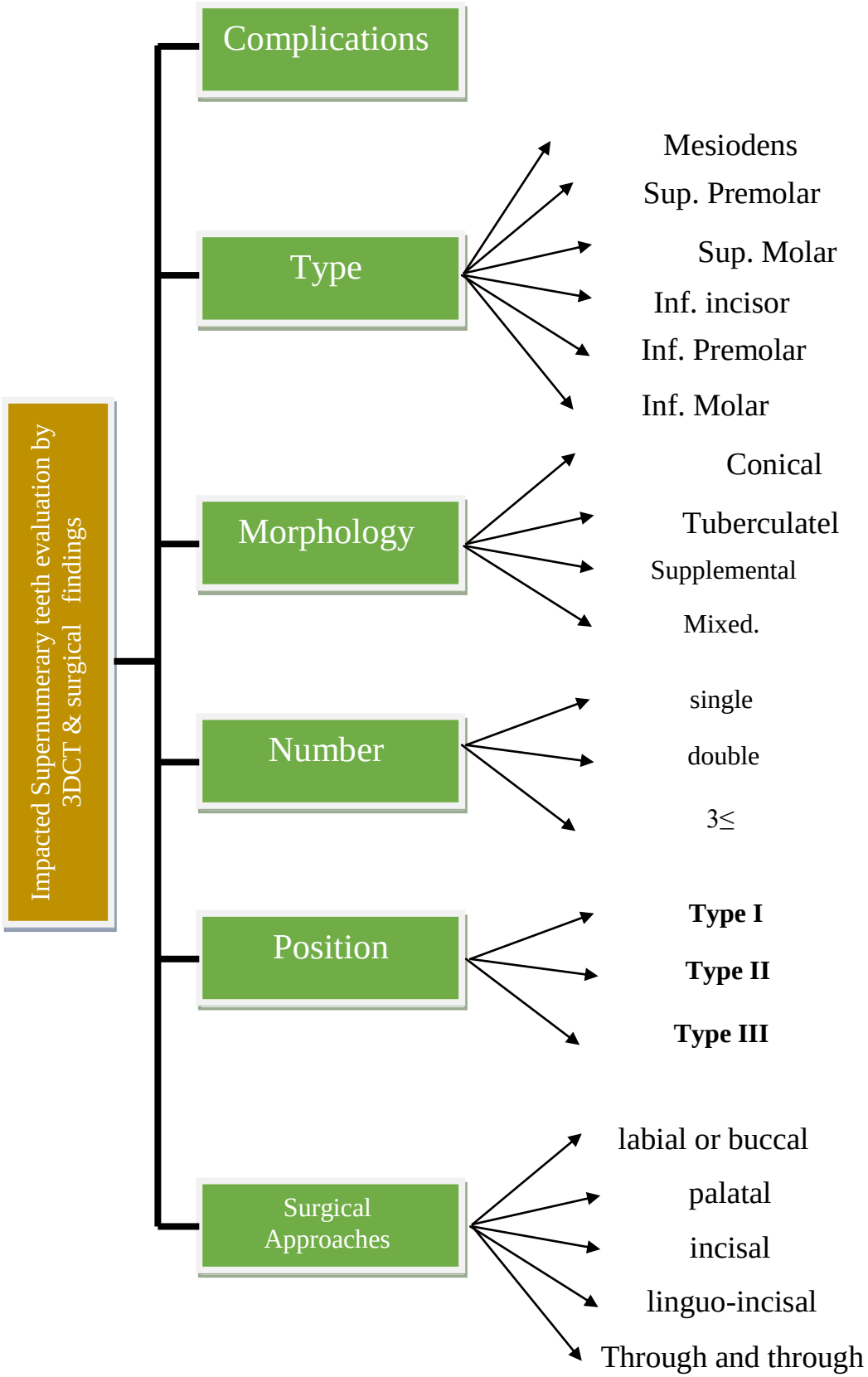


Fig (1): A descriptive study related to impacted supernumerary teeth evaluation by 3DCT scan and surgical approaches.

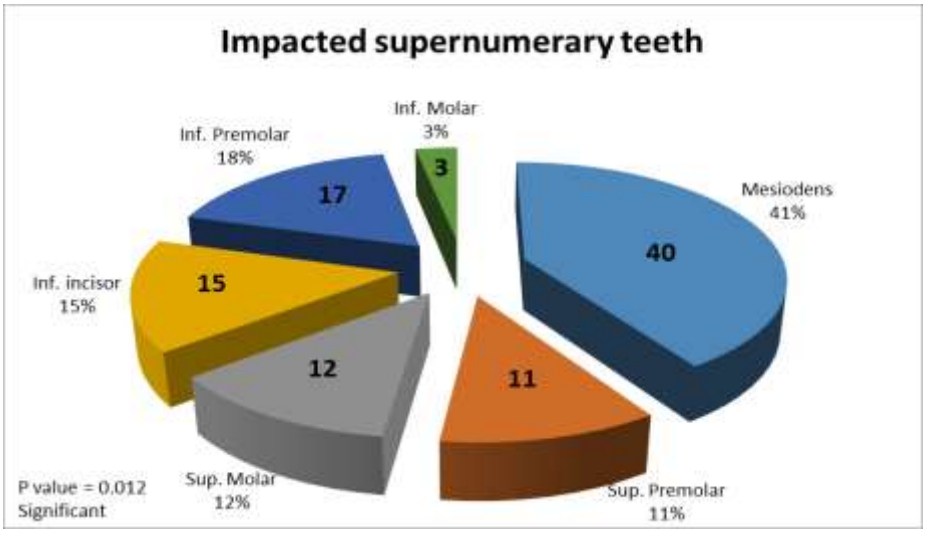


Fig (2): Incidence of surgical treatment related to the impacted supernumerary teeth regions type within jaws .

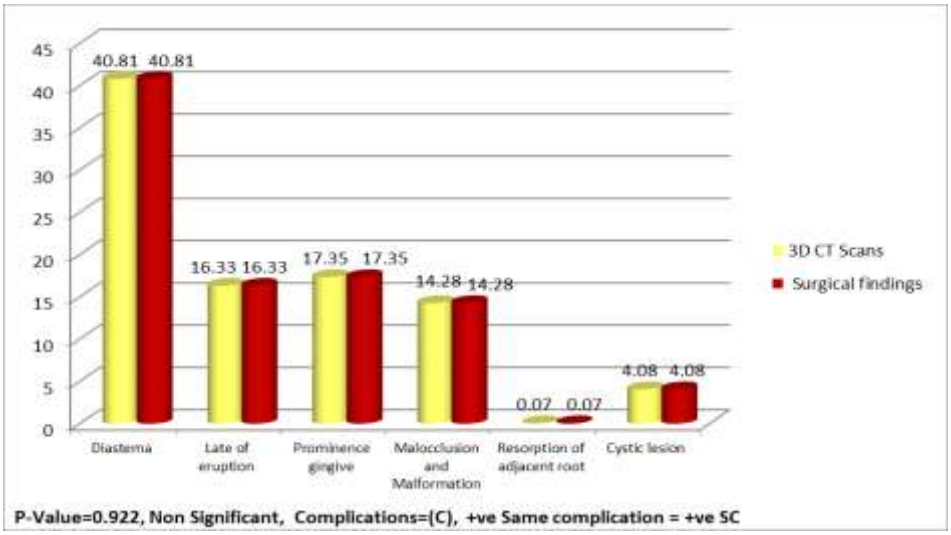


Fig (3): Types of complications caused by impacted supernumerary teeth by 3DCT scan and surgical findings.

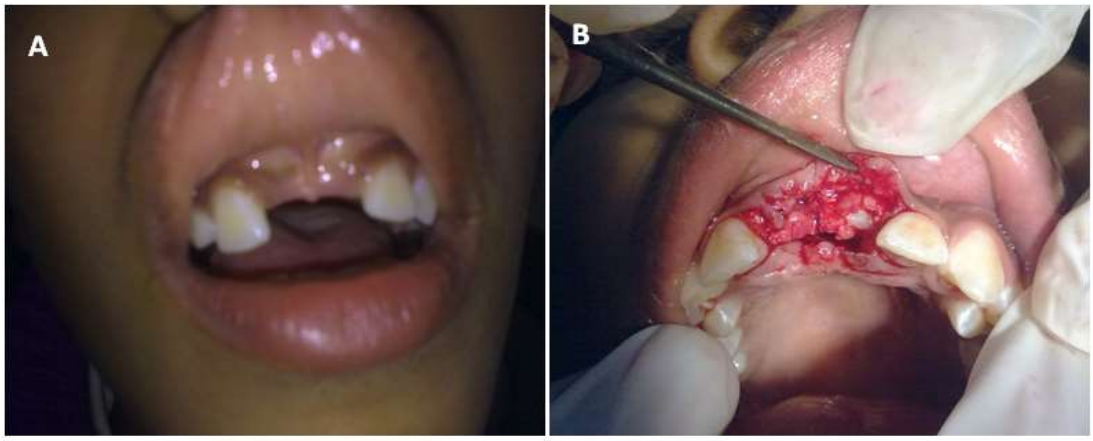


Fig (4): 12 years old female patient with superior impacted supernumerary teeth causing delay of eruption of upper 2 centrals incisors . (A) Before surgery, (B) Transoperative image.

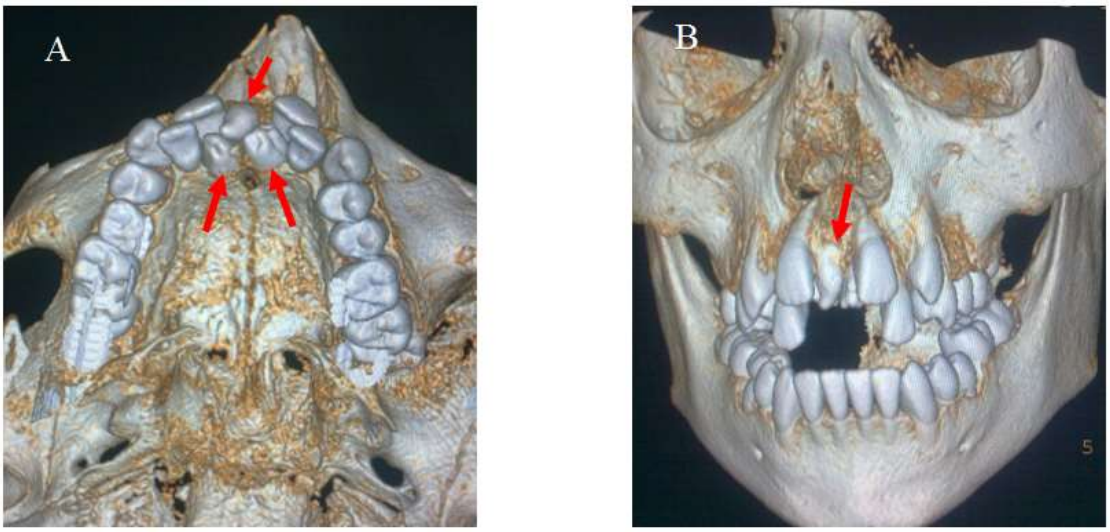


Fig (5) : Dental 3D Software CT with multiplanner reconstruction of premaxilla demonstrating a multiple superior impacted supernumerary teeth (red arrows) for the same patient aged 12 year shows the malocclusion, crowding, delay eruption and diastema, (A). Occlusal view .Three multiple superior impacted supernumerary teeth in premaxilla, one conical shape, Type III (labially positioned), causing diastema of upper centrals incisors, right one supplemental shape, the left one Tuberculate shape ,both are Type II (palatally positioned) causing malocclusion, crowding and delay eruption. All are 3≤ number presented. (B) Frontal view of skull and maxilla shows the diastema of upper impacted centrals incisors caused by conical superior impacted supernumerary teeth (red arrows).



Fig (6): 20 years old female patient with superior impacted supernumerary teeth causing malocclusion, crowding and prominence of gingiva.

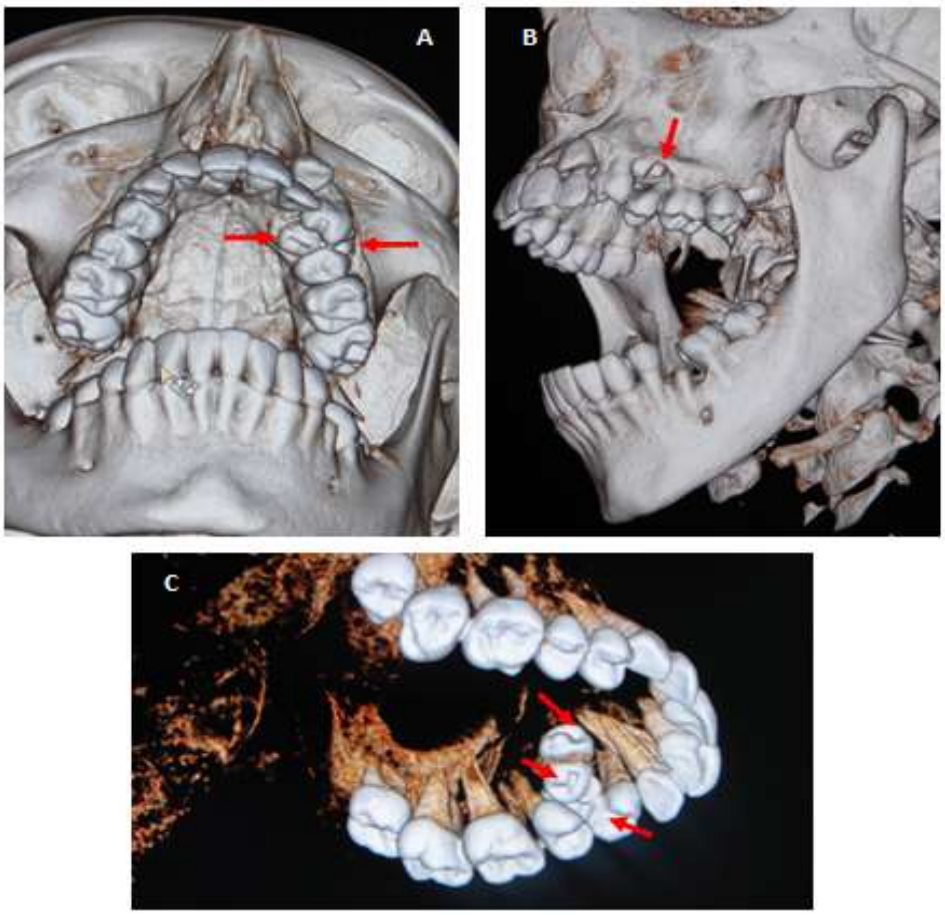


Fig (7): Dental 3D Software CT with multiplanner reconstruction of maxilla demonstrating a relationship between the left three superior premolar impacted supernumerary teeth (red arrows) with the other teeth caused the malocclusion, and crowding, for the same patient aged 20 years. (A) Occlusal view of maxilla, Tow superior premolar impacted supernumerary teeth, Type II, supplemental shape, caused the malocclusion, and crowding. (B) Latral view of left half of skull and jaws, one superior premolar impacted supernumerary teeth ,Type I , supplemental shape caused the malocclusion, and prominence of gingival (red arrows). (C) Occlusal view of maxilla, accumulation of 3 ≤ number presented of superior premolar impacted supernumerary teeth (red arrows).

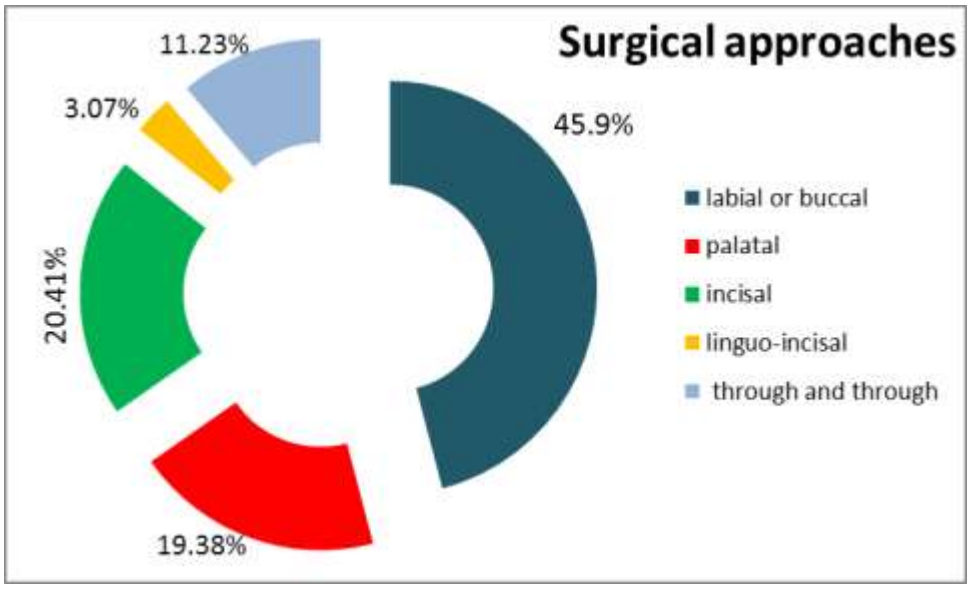


Figure (8): Surgical approaches for removing impacted supernumerary teeth.

Table (1): The descriptive statistical results of patient's ages.

Age	No. & %	Min.	Max.	Mean	SD
Female	26(34.67%)	10	43	23	8.857
Male	49(65.3%)	10	43	21	7.326

Ratio males: females 1.8:1 total No. = 75 patients

Table (2): Assessment the morphology of 98 impacted supernumerary teeth by 3DCT scan and surgical procedure findings.

Morphology of Impacted Supernumerary Teeth	No. & % of (IST) by 3 D CT scans	No. & % of (IST) by Surgical findings
Conical	34 (34.69%)	34 (34.69%) +ve SF
Tuberculatel	31 (31.63%)	31 (31.63 %) +ve SF
Supplemental	28 (28.57%)	28 (28.57%) +ve SF
Mixed	5 (5.11%)	5 (5.11 %) +ve SF
Total teeth	98 (100%)	98 (100%) +ve SF

P-Value= 0.986 Non Significant, Impacted Supernumerary Teeth = IST, +ve Similar form = +ve SF

Table (3): Assessment the number of impacted supernumerary teeth by 3DCT scan and surgical findings related to the number of patients.

Number of of Impacted Supernumerary Teeth	No. & % of (IST) by 3 D CT scans	No. & % of (IST) by Surgical findings	No. & % 0f Patients
Single	58 (59.18%)	58 (59.18%) +veTN	58 (77.33%)
Double	22 (22.46%)	22 (22.46%) +ve TN	11 (14.67 %)
3 ≤	18 (18.36 %)	18 (18.36 %)+veTN	6 (8 %)
Total teeth	98 (100%)	98 (100%) +veTN	75 (100%)

P-Value= 0.926, Non-Significant, Impacted Supernumerary Teeth = IST, +ve True number = +ve TN

Table (4): Assessment and classification of the positional areas of 98 impacted supernumerary teeth by 3DCT scan and surgical findings.

Type of Impacted Supernumerary Teeth IST	No. & % of IST	3D CT views No. & % of IST + according to Positional area classification			Surgical findings of IST		
		Type I	Type II	Type III	No. of extracted IST	Type of surgical flap	Results No.
Mesiodens	40 (100%)	4 (10%)	7 (17.5%)	29 (72.5%)	8	Labial flap	40 CP
					12	Palatal flap	
					13	Incisal flap	
					7	Through and through flaps	
Superior premolar	11 (100%)	3 (27%)	6 (54.5%)	2 (18.2%)	3	Buccal flap	11 CP
					4	Palatal flap	
					4	Through and throght	
Superior paramolar	12 (100%)	9 (75%)	3 (25%)	0 (0%)	9	Buccal flap	12 CP
					3	Palatal flap	
Inferior	15	3	1	11	7	Labial flap	15 CP

incisor	(100%)	(20%)	(6.7%)	(73.3%)	1	Lingual flap	
					7	Incisal flap	
Inferior premolar	17 (100%)	15 (88.2%)	2 (11.8%)	0 (0%)	15	Buccal flap	17 CP
					2	Linguo-incisal flap	
Inferior paramolar	3 (100%)	3 (100%)	0 (0%)	0 (0%)	3	Buccal flap	3 CP
Total		98 (100%)			98 (100%) CP		

P-Value= 0.889, Non-Significant, Impacted Supernumerary Teeth = IST, Correct position = CP

Table (5): Successfulness percentages of 3DCT scan in determining the characteristics features of 98 impacted supernumerary teeth in 75 patients .

impacted supernumerary teeth characteristics features	No. &% of ISTby 3DCT scan	No.& % of IST by surgical findings
Jaw Location	98 (100%)	98 (100%) +veRL
Morphology	98 (100%)	98 (100%) +ve SF
Number	98 (100%)	98 (100%) +ve TN
Positional area	98 (100%)	98 (100%) +ve CP

+ve= positive, RL=Right Location, Similar form = SF, True number = TN, Correct position = CP

References:

1. Raupp S, Kramer PF, Oliveira HW, Rosa FM, Junior IMF. Application of computed Tomography For Supernumerary teeth Location in Pediatric Dentistry.The Journal of Clinical Pediatric Dentistry .2008; 32(4):273-276.
2. Walker L, Enciso R, Mah J. Three dimensional localization of maxillary canines with cone-beam computer tomography. Am J Orthod Dentofac Orthop, 128(4): 418–23, 2005.
3. Kitai N, Fuji Y, Murakami S. Three-dimensional evaluation of a rare case with multiple impacted teeth using CT. J Clin Pediatric Dent, 27(2): 117–21, 2003.
4. Kim KD, Ruprecht A, Jeon KJ, Park CS. Personal computer-based three dimensional computed tomography images of the teeth for evaluating supernumerary or ectopically impacted teeth. Angle Orthod, 73(5): 614–21, 2003.
5. Luka B, Brechtelsbauer D, Gellrich N, Köning M. 2D and 3D CT reconstructions of the facial skeleton: an unnecessary option or a diagnostic pearl? Int J Oral Maxillofac Surg, 24: 76–83, 1995.
6. Moore SR, Wilson DF, Kibble J. Sequential development of multiple supernumerary teeth in the mandibular premolar region—a radiographic case report. Int J Paediatr Dent, 12: 143–5, 2002.
7. Rajab LD, Hamdan MA. Supernumerary teeth: review of the literature and a survey of 152 cases. Int J Paediatr Dent. 2002;12:244- 54.
8. Garvey MT, Barry HJ, Blake M. Supernumerary teeth--an overview of classification, diagnosis and management. J Can Dent Assoc. 1999;65:612-6.
9. Kokten G., Balcioglu H., Buyukertan M. (2003) J. Contemp. Dent. Pract., 4, 67-76.
10. Thesleff I. The genetic basis of tooth development and dental defects. Am J Med Genet A. 2006;140:2530-5.
11. Marya C.M. and Kumar B.R. (1998) Quint. Int., 29, 49-15.

12. Nazif MM, Ruffalo RC, Zullo T. Impacted supernumerary teeth: a survey of 50 cases. J Am Dent Assoc. 1983;106:201-4..
13. Stahl F, Grabowski R, Wigger K. Epidemiology of Hoffmeister's "genetically determined predisposition to disturbed development of the dentition" in patients with cleft lip and palate. Cleft Palate Craniofac J. 2006;43:457-65.
14. King NM, Lee AM, Wan PK. Multiple supernumerary premolars: their occurrence in three patients. Aust Dent J. 1993;38:11-6.
15. Kalra N, Chaudhary S, Sanghi S. Non-syndrome multiple supplemental supernumerary teeth. J Indian Soc Pedod Prev Dent. 2005;23:46-8.
16. Desai R.S. and Shah N.P. (1998) J. Oral Pathol. Med., 27, 411-413.
17. Mitchell L, "Supernumerary teeth," *Dental Update*, vol. 16, no. 2, pp. 65–68, 1989.
18. Tumen1 E.C., I. Yavuz I., Tumen D.S., Hamamci N., Berber G., F. Atakul F., Uysal E. The detailed evaluation of supernumerary teeth with the aid of cone beam computed tomography. Biotechnol. & Biotechnol. Eq. 24/2010/2. DOL:10.2478/V133-0023-5 : 1886-1892.
19. Leco Berrocal MI, Martín Morales JF, Martínez González JM. An observational study of the frequency of supernumerary teeth in a population of 2000 patients. Med Oral Patol Oral Cir Bucal. 2007;12:E134-8.
20. Scheiner MA, Sampson WJ. Supernumerary teeth. A review of the literature and four case reports. *AustDent J*. 1997; 42:160–165.
21. Shafer WG, HineMK, Levy BM. Supernumerary teeth. In: Shafer WG, HineMK, Levy BM. A textbook of oral pathology. 3ª ed. Philadelphia: WB saunders Co; 1974. p. 42-7.
22. Nematolahi H, Abadi H, Mohammadzade Z, Ghadim M.S. The Use of Cone Beam Computed Tomography (CBCT) to Determine Supernumerary and Impacted Teeth Position in Pediatric Patients: A Case Report. J Dent Research, Dent Clinic, Dent Prospects. 2013; 7(1): 47–50.
23. Liu DG, Zhang WL, Zhang ZY, Wu YT, Ma XC. Three-dimensional evaluations of supernumerary teeth using cone-beam computed tomography for 487 cases. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2007;103:403-11.
24. Bairak S, Dalci K, Sari S. Case report: Evaluation of supernumerary teeth with computerized tomography. Oral Surg Oral Med Oral Pathol Oral Radiol Endod, 100(4): e65–9, 2005.
25. Chaushu S, Chaushu G, Becker A. The role of digital volume tomography in the imaging of impacted teeth. World J Orthod, 5(2): 120–32,2004.
26. Patchett CL, Crawford PJ, Cameron AC, Stephens CD. The management of supernumerary teeth in childhood--a retrospective study of practice in Bristol Dental Hospital, England and Westmead Dental Hospital, Sydney, Australia. Int J Paediatr Dent. 2001;11:259-65.
27. Hattab FN, Yassin OM, Rawashdeh MA. Supernumerary teeth: a report of three cases and review of the literature. ASDC J Dent Child, 61: 382–93, 1994.
28. Nazhat M. Abdlkareem , Safaa H. AL Noume , ARassol H., Hamad T.Y. Comparison of Three Dimensional Dental Software Computed Tomography findings with real time surgical approaches for impacted teeth. Tikrit Journal for Dental Sciences. 2013; 3(1):113-122.
29. Fernández Montenegro P, Valmaseda Castellón E, Berini Aytés L, Gay Escoda C. Retrospective study of 145 supernumerary teeth. Med Oral Patol Oral Cir Bucal. 2006;11:E339-44.
30. Salcido-García JF, Ledesma-Montes C, Hernández-Flores F, Pérez D, Garcés-Ortíz M. Frequency of supernumerary teeth in Mexican population. Med Oral Patol Oral Cir Bucal. 2004;9:407-9; 403-6.
31. Luten J: The Prevalence of supernumerary teeth in primary and mixed dentition. J Dent Child 34: 48–49 (1967).
32. Ziegler C.M., Woertche R., Brief J. et al. (2002) Dentomaxillofac. Radiol., 31, 126-130.

33. So L.L.Y. Unusual supernumerary teeth. Angle Orthod 1990;60:289-92.
34. Yusof W.Z. Non –syndrome multiple supernumerary teet :literature review: J. Can. Dent. Assoc.1990Feb; 56(2): 147-149.
35. Liu J. Characteristics of premaxillary supernumerary teeth: a survey of 112 cases. ASDC J Dent Child, 62: 262–5, 1995.
36. Batra P, Duggal R, Parkas H: Non-syndromic multiple supernumerary teeth transmitted as an autosomal dominant trait. J Oral Pathol Med 34: 621–625 (2005).
37. Hogstrom A, Anderson L: Complications related to surgical removal of anterior supernumerary teeth in children. ASDC J Dent Child 54: 341– 343 (1987)..
38. Mitchell L, Bennett TG. Supernumerary teeth causing delayed eruption – a retrospective study. Br J Orthod 1992;19:41-6.
39. Foster TD, Taylor GS. Characteristics of supernumerary teeth in the upper incisor region. Dent Pract 1969;20:8-12.
40. Bodin I, Julin P, Thomsson M: Hyperodontia; Frequency and distribution of supernumerary teeth among 21,609 patients. *Dentomaxillofacial Radiology*, 1978; 7:15-17.
41. Katheria BC, Kau CH, Tate R, Chen JW, English J, Bouquot J. Effectiveness of impacted and supernumerary tooth diagnosis from traditional radiography versus Cone Beam Computed Tomography. Pediatr Dent . 2010;32:304–9.
42. Lemkamp M, Filippi A, Berndt D, Lambrecht JT. Diagnostic possibilities of digital volume tomography. Shweiz Monatsschr Zahnmed, 116(6): 645–53, 2006.
43. Murmulla R., Wortche R., Muhling J. et al. (2005) Dentomaxillofac. Radiol., 34, 28-31 .
44. Eric H, Shafaa H.A. A specific focus imaging for dental implant planning (CT-Based). Abstract Book Of The First National Conference For Iraqi Dental Colleges 24-25-26/4/2012:48
45. Eric H, Sturat A G, Janice S L, et al.,: Comparative analysis of traditional radiographs and cone-beam computed tomography volumetric images in the diagnosis and treatment planning of maxillary impacted canines. American Journal of Orthodontics & Dentofacial Orthopedics 2010 Volume 137, Issue 5 , Pages 590-597.
46. Bodner L, Bar-Ziv J, Becker A. Image accuracy of plain film radiography and computerized tomography in assessing morphological abnormality of impacted teeth. Am J Orthod Dentofacial Orthop 2001; 120(6):623–628.