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RESEARCH ARTICLE

TRENDS IN TREATMENT MODALITIES FOR HEMIMANDIBULECTOMY PATIENT: A SYSTEMATIC REVIEW

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ABSTRACT

Aim: To compare the changing trends between implant supported prosthesis and cast partial dentures for patients with hemimandibulectomy

Study design & methods: MEDLINE-PubMed, Cochrane, EbscoHost and Google Scholar were searched from January 1985 to December 2015. Appropriate case reports, case series or clinical reports which indicated the cause for resection were included. The data was compared only between implant supported prosthesis and removable cast partial denture. Masticatory efficiency, esthetics and functional ability were selected as outcome variables.

Results: Independent screening of the titles and abstracts of 73 MEDLINE-PubMed articles and 34 articles from Google Scholar resulted in 37 publications that met the eligibility criteria. From the year 1985 to 1995 (first decade), implant supported prosthesis was used widely. In the second decade of the study (1996 to 2005), implant supported prosthesis proved to be useful in such patients. In the third decade (2006 to 2015), the trends changed. Removable cast partial denture was considered to be favourable.

Conclusion: Cast partial dentures were introduced earlier to prosthodontics than implant supported prosthesis. Inspite of this, implant supported prosthesis has been used since decades to treat patients with hemi mandibulectomy. However, many drawbacks were observed with this treatment and later cast partial denture was chosen as a better treatment modality which proved advantageous to their dental health.

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INTRODUCTION

Mandible is regarded as one of the primary bones in the facial skeleton (Beumer, 1996 and Taylor, 1997). It is a solitary bone which creates marginal boundaries for the floor of oral cavity. Statistics show that oral carcinoma is one of the most common forms of the disease and has dispensed startling universal increase in the last few decades (Parkin, 2002 and de Camargo Cancela, 2010). More than 90 % of head and neck cancers are identified as squamous cell carcinomas (Haddad, 2008). Absolute surgical treatment in patients with malignant or benign lesions of the mandible results in problems with speech, deglutition, and masticatory function along with lack of bony support, movable soft tissue and lack of stability (Ferraro, 1993). These difficulties may be with functions or esthetics or can be the combination of both (Abdulwassie, 2001). Tumor enucleation and curettage are considered sufficient for small unicystic or peripheral lesions (Tamme, 2010).

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The symmetry and balance of the mandible is destroyed due to loss in continuity, leading to modified mandibular movements and deviation of the mandible towards the surgical site.[1] Also such patients with gross developmental or acquired defects are often melancholy and may even exhibit significant withdrawn behaviour (Varaoujan, 1979). Jaw reconstruction is carried out to establish continuity of the jaw. It also minimizes the functional and psychological impact to the patient after jaw resection. Prosthetic rehabilitation provides optimal tissue supporting bed (Chiapasco, 2008 and Tideman, 1998). Depending on the location and extent of the lesion, the prosthetic rehabilitation is determined and anticipated surgical treatment is then carried out with the view of improving the patients health (Ronald, 1979).

After the reconstructive surgery, there are only two main treatment options left with the patient and the dentist to rehabilitate the mandible.

- Implant supported prosthesis
- Removable cast partial denture (Taylor, 1996).

The goals of prosthodontic treatment include providing lip support, improving articulation, reducing drooling, and regaining favourable esthetics (Beumer, 1996; Sahin, 2005 and Cheng, 1999). The following are some of the goals of mandibular reconstruction from the restorative dentist's standpoint:

Restoration of jaw continuity: The greatest amount of mandibular form and function can be achieved only by restoration of the mandibular continuity. Restoration of mandibular form will also improve facial symmetry and denture esthetics.

Provision of a better prosthesis bearing area: Prosthetic rehabilitation is dependent on adequate bone height and width for proper support, retention, and stability of the prosthesis and for the restoration of a functional occlusal relationship. The graft must be long lasting and able to withstand the functional demands placed on it (Silverberg, 1985).

This systematic review mainly focuses on the how the trends have changed between implant supported prosthesis and removable cast partial denture since decades to treat patients with hemi mandibulectomy.

Aim

A systematic review of the available literature was conducted To compare efficiency between implant supported prosthesis and removable cast partial dentures for patients with hemi mandibulectomy.

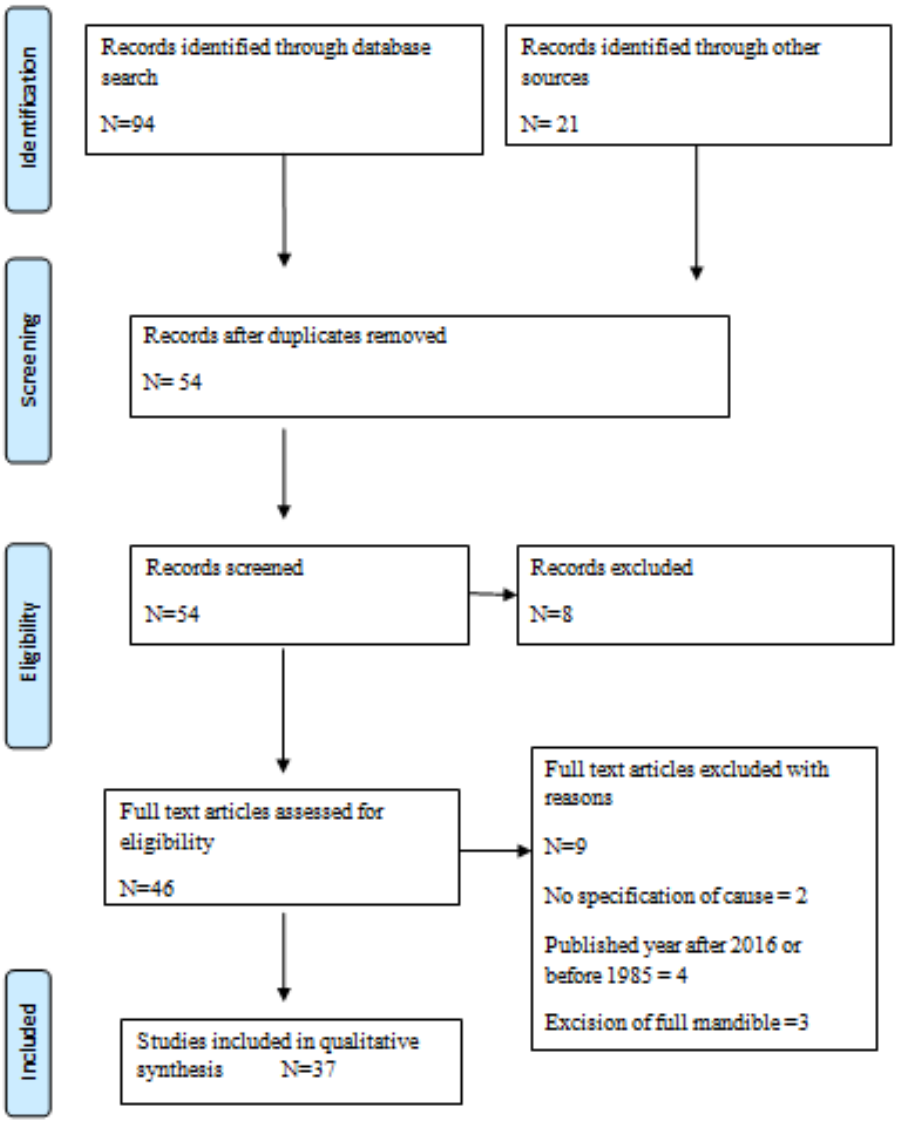
Study design and methods

A systematic search of published scientific papers was performed in the electronic PubMed database, EbscoHost, Google Scholar and dental journals using specifics keywords 'hemimandibulectomy', 'Implant supported denture', 'Cast partial denture'. Further it was filtered using Boolean operators (And, Or, Not) and combination of specific keywords were used. A custom range of 30 years between 1985 to 2015 was applied. All the data was searched only till 31st December 2015 (Flowchart 1).

Inclusion Criteria

Studies were selected if they met the following inclusion criteria:

- Articles in English or those having detailed summary in



Flowchart 1. Prisma flow diagram

- Studies published between 1st January 1985 to 31st December 2015.
- Age group 25 or higher.
- Patients having intact mandible on either side of the jaw.

Exclusion criteria

Studies were excluded with the following criteria

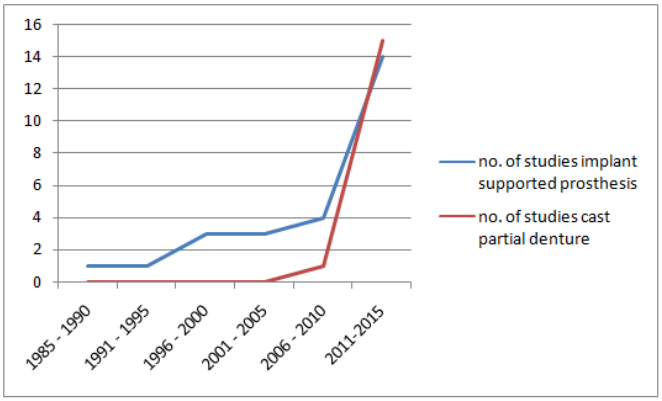
- Reviews, abstracts, letters to editors and in vitro studies are excluded.
- Patients whose less than half of mandible is resected.
- Case reports which do not mention the cause for resection of half of the mandible.

Data collection

A standard pilot form was provided by an expert (PK) and all the headings not applicable for the review were removed. One reviewer (DK) screened independently the titles and abstracts and did the primary search. Data extraction was done for all the 37 articles and reviewed by second author of this study (DK). Any disagreement was resolved by consensus. All the necessary changes were made and again given to an expert for review.

RESULTS

A graph is plotted with X and Y axis which tells about the changing trends. Till the year 2003, line graph of cast partial denture showed a plane format implicating no studies done. There was a rise in studies in the next five years and suddenly the graph shooted up to account for total 15 studies alone in 2015. On the other hand, the line graph of implant supported prosthesis showed a steady rise with some number of studies done every five years right from 1985. Around the year 2008, implant supported prosthesis treatment gained momentum and was used for more and more number of patients Graph 1.



Graph 1. Shows the changing trends between1985 to 2015

DISCUSSION

Patient selection plays a pivotal role in implant rehabilitation.[16] First and foremost, a suitable donor site must be selected if implant rehabilitation is planned which enables improved placement and osseointegration of implants. Iliac crest is the site of choice as it has suitable dimensions for implantation. Then comes the scapula followed by fibula. The radius is the least reliable donor sites (Dominici, 1995; Frodel, 1993; Mososco, 1994 and Zarb, 1993). Grafts are mostly placed for improving the height and width of the available bone. There is significant risk of osteoradionecrosis for patients who have previously undergone radiation therapy and therefore implant placement is contraindicated in these patients (Granstrom, 2003). Hyperbaric oxygen therapy should be considered prior to implant placement so that tissue complications are minimized. Inspite of the advantages implants offer, there are many disadvantages to the same. The ratio of crown to implant length should be reviewed. If the ratio is enormous, it will not only decrease the lifespan of the implant from a biomechanical perspective, but also curb its esthetic outcome (Garcia-Garcia, 2003 and Mazzonetto, 2005). The success of the rehabilitation process in removable partial denture depends on a multitude of factors like type of surgical defect, wound closure, presence or absence of condyle on the resected side, treatment planning, follow up and patient cooperation (Thomas, 2000). It also depends upon the presence of bony structures with minimal sacrifice of tongue, floor of the mouth and adjacent soft tissues. Conservative management is always beneficial for rehabilitation as there is minimal loss of structures (Barttelbort, 1987). After analysing the case reports and the case series included in the study, a conclusion was drawn upon that, prosthodontics has been changing in its way. Although, removable cast partial dentures were into existence way before implants, their importance to treat in mandibulectomized patients came into consideration later on.

1st decade (1985 to 1995) : Two studies were included in this category. Both the studies had a common intervention. A patient suffering from a tumor, got hemimandibulectomy performed with the resection of the left condyle. There was significant function of the mandible with a little deviation on opening. Transmandibular implants were placed on the resected mandible with dolder bar for retention. A follow up period of 18 months was provided (Sindet-Pedersen, 1988).
In 1992, a similar case was reported by Peter A. Cilento et al. Implant placement was combined with Hader bar and an overlay prosthesis was fabricated which proved to be both esthetic and functional (Cilento, 1992).

2nd decade (1996 to 2005): Six studies were included in this category. All the studies had a common way of treating patients with hemi mandibulectomy. Implant supported prosthesis was given to the patients. A study conducted in 1997 by Chang YM et al stated that implants were placed, followed up for three years, and achieved an 88% survival rate.[28] The esthetics and the masticatory efficiency has definitely improved. In the year 1999 two studies were conducted for treating odontogenic fibromyxoma and ameloblastoma respectively. A total of 33 implants were placed in the study done by Maria B. Papageorge and followed up for 16-54 months. The survival rate was 85% as 5 out of the 33 implants failed to osseointegrate (Papageorge, 1999). When Jon Turesky did a similar study, he found that the when implants were placed in resected mandible due to ameloblastoma, they osseointegrated well and gave good functional and esthetic outcome (Turesky, 1999). Mehmet Dalkiz did a study on a man with gun shot wound in Turkey and found that after free fibular bone graft, the implants had a good survival rate (Dalkiz, 2001). Hassan Abdulwassie placed implants in a young patient who had resected mandible due to ossifying fibroma. He proved to be successful and the patient now has improved functions and esthetics (Abdulwassie,

2001). In the year 2004, Dan Oelgiesser treated a patient suffering from squamous cell carcinoma with implants in mandible. The patient had maxillary complete denture and lower fixed implant prosthesis. It was followed up for 6 months and the implants were successful (Oelgiesser, 2004).

3rd decade (2006 to 2015): Removable cast partial denture was introduced and was accepted as a treatment modality in the earlier years of the decade. Later, it was used more often than implant supported prosthesis. Cast partial denture can be placed after augmenting the bone with iliac bone graft (Joshi, 2008). A total of 29 studies were carried out during this period. 15 studies included removable cast partial denture as the treatment modality while 14 studies had implant supported prosthesis as the treatment. In the year 2008, two studies were conducted with two treatment modalities. The one done by Jose Raphael de Moura Campos Montoro said implants are successful in resected mandible. His patient achieved satisfactory chewing efficiency after the rehabilitation (José Raphael de Moura Campos Montoro, 2008), Second study done by Pramod Raj Joshi used cast partial denture. The patient had ameloblastoma. His functional ability was satisfactory after a period of followup (Joshi, 2008), Hutchinson reported a study of osteosarcoma. After full bony reconstruction of the mandible, implants were placed and followed up for 30 months.the result was satisfactory with improved esthetics (Hutchison, 2009). Pietro Felice did a step osteotomy anteriorly. This type of osteotomy tapers in a smile shaped cut in the posterior region. This unique technique for placement of implants gave a successful result for the patient in terms of function. A milled bar was used to rehabilitate a patient who suffered from squamous cell carcinoma. Grafting of the site and distraction osteogenesis was carried out before implant placement. This case was followed up for 3 years and it was still found to be giving improved functional ability to the patient (Felice, 2009).

In the year 2011, a study was performed by Natashekhar which described the use of distraction osteogenesis followed by fixed implant supported prosthesis to treat post surgical defect formed as a result of resection of ameloblastoma. The case was followed up for 2 years and esthetics and masticating efficiency was improved over time (Natashekar, 2011). Two more studies were done in the year 2011. Both the studies were done using cast partial denture and found improved results while one study conducted in new jersey was done using autogenous bone graft and implant placement. It was followed up for 8 years and the functions, masticatory efficiency and esthetics were said to be improved considerably (Minichetti, 2011 and Singh, 2012). In the year 2012, three studies were conducted. Veena saraf did a study on the patient with squamous cell carcinoma and used cast partial denture. A brief followup of 3 months was done and resulted in improved esthetics of the patient (Saraf, 2012). The other two studies used implant supported prosthesis as their treatment of choice. One patient described had leiomyosarcoma (Ntounis, 2013), and the other had ameloblastoma (Gil, 2012). Improved esthetics and function were seen in the patients (Ntounis, 2013 and Gil, 2012). In the year 2013, six studies were carried out out of which four chose implants while the remaining two chose cast partial denture for the treatment. Three cases had their mandible resected due to ameloblastoma. All the three cases were rehabilitated with implant supported prosthesis. It tremendously improved their esthetics and chewing efficiency (Bianchi, 2013; McKenna, 2013 and Murat, 2013). A study was done by G McKenna and he used swing lock partial denture for a patient suffering from Pindborgs tumor. This technique overcame challenging clinical case in simple fashion, avoiding invasive and expensive procedure like that of implants (Bianchi, 2013).

Vitomir S. Konstantinovic used implant supported prosthesis for rehabilitation. First mandibular reconstruction was carried using free bone grafts as the bone dimension was insufficient. Instead, disk implants can also be used as an alternate treatment option. This gave a satisfactory esthetic and masticatory outcome after a brief followup (Konstantinović, 2013). In Turkey round the same year, a case was treated again by simple implant supported prosthesis with palatal guide ramp positioning device. This allowed for stable interocclusal relationship along with the increase in tongue space which improved chewing efficiency of the patient (Murat, 2013). Cast partial denture was used after resection of the mandible for ameloblastoma in Malaysia. Improvement in the oral function of the patient was seen which made a positive impact on the life of the patient (Sitthiphan, 2013). A total of 11 cases were reported in the year 2014 and 2015. 9 cases used removable cast partial dentures as the treatment while only 2 used implant supported prosthesis. Four authors reported four different cases of the patients suffering from squamous cell carcinoma. To rehabiliate the resected mandible, cats partial denture was used and followed up for varied amount of time ranging from 6 months to 2 years. All the cases were seen to have satisfactory results with improved chewing and functional efficiency guiding flange prosthesis was given along with cast partial denture to improve the esthetics and occlusion of the patients (Dhanraj, 2015; Mundhe, 2014; Jamayet, 2015 and Kar, 2015).

Rajesh Bansal in Banaras used implant supported treatment and placed three implants in the resected site. Out of the three, one implant failed to osseointegrate. The efficiency achieved by remaining two implants was adequate for the patient to carry out his basic functions (Singh, 2014). Bijay singh in 2015, provided mandibular guidance therapy to the patient and followed up for 2 years. The masticatory outcome was poor but the patient could now achieve proper centric occlusal position (Singh, 2015). A case series was carried out in 2013 by Bernardo Bianchi. They showed 2 patients who had lesions in the mandible and had to be surgically excise half of it. Both the patients had to be treated with implant supported denture. The cases were followed up for 18-120 months and it was found that their functional ability had improved adequately (Dhanraj, 2015). Three cases of implant supported prosthesis were reported. Marcelo Coelho Goiato and H. Serder Cotert reported a case for epidermoid cancer (Goiato, 2015). Sohil Daswani reported a case for motor vehicle accident. Implant supported prosthesis gave adequate benefit for the patient. Along with the intra oral rehabilitation, H. Serder Cotert also carried out extra oral rehabilitation of mid facial defect. All the implants osseointegrated well and had great functional and esthetic results (Goiato, 2015 and Serdar Çötert, 2015). A case reported in Navi Mumbai by Rubina Tabassum used removable cast partial denture. Follow up for 8 months was done and the results were satisfactory (Tabassum, 2014).

Study limitations

Due to the inclusion of only case reports, some information regarding the advantages and disadvantages of both the treatment modalities might have been lost. This study is based

on partially edentulous subjects and therefore the fully edentulous cases were excluded from the study. In the various databases utilized for making this systematic review, many articles suitable to the topic only had their abstracts in English whereas the full text was in a language other than English due to which they were excluded from the review. Case reports which did not mention the cause were also excluded. Sometimes the cause tells us the condition of the bone involved. Therefore, the information remained adequate without the cause of the resection

Clinical application

Significantly successful outcomes have been witnessed in the field of rehabilitation of cancerous patients. The dentist must adapt to the lesser invasive techniques for the already suffering patients.

Conclusion

Since the last two decades, refinement of free vascularised flaps to reconstruct the tongue and mandible and the use of osseointegrated implants to restore the dentition, have enabled the multi disciplinary teams to restore the oral form and function for most patients. The prosthodontist proves to be a corner stone in restoring patients with resected portion of mandible. The flaps and the soft tissues can be contoured such that they achieve most bulk and almost restore normal tongue conditions. The bony portion of the flap can be used to restore the mandible, preserving the complex maxillo-mandibular system. Lifelong treatment options are usually provided by a definitive removable cast partial denture prosthesis or an implant supported prosthesis. Depending on the age, tumor extension, psychology, and the cost factor, suitable treatment is to be given to the patient. In this review, it was concluded that implant supported prosthesis was used in the first decade of the study. In the second decade from 1996 to 2005, majority of the studies were carried out for implant supported prosthesis but a few were carried out with cast partial denture. However, in the third decade, from 2006 to 2015, all the studies included cast partial denture as their main treatment modality. Rehabilitation helps to readapt a disabled person to the society, but ultimately it is the society that must be rehabilitated to reduce its prejudice, foster inclusiveness with increased acceptance of the difference.

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