THE FUTURE OF MAXILLOFACIAL PROSTHETICS IN LIBYA: A CALL TO ESTABLISH THE FIELD

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ABSTRACT:

Maxillofacial prosthetics is a subspecialty of prosthodontics with a relatively wide scope in that it provides prosthetic rehabilitation and therapeutic appliances for numerous disorders, injuries, and defects of the head and neck region. This subspecialty is widely recognized in developed countries, but less so in many developing countries. This special article is an initial effort to review the current status of maxillofacial prosthetics in Libya's health and higher education sectors and its future establishment. In addition, we outline the steps needed to move beyond the current status quo in Libya. Based on a review of internationally recognized maxillofacial prosthetic programs based in North America, Europe, Japan, and South Africa, two plans for establishment are recommended for this purpose: an urgent short-term plan and an institutional long-term plan. Applying both plans would initially support maxillofacial prosthetic providers in managing patients with maxillofacial defects and developing contingency plans for follow-up and maintenance.

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مستقبل استعاضة الوجه والفكين في ليبيا: دعوة لإنشاء التخصص

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استعاضة الوجه والفكين هو تخصص منبثق من تخصص التعويضات السنية والذي يعنى بإعادة التأهيل الإصطناعي للعديد من الإصابات والعيوب في منطقة الرأس و الرقبة. هذا التخصص معترف به على نطاق واسع في البلدان المتقدمة، ولكن أقل من ذلك في العديد من البلدان النامية. هذه الورقة هي جهد أولي لمراجعة الوضع الحالي لاستعاضة الوجه والفكين في قطاعي الصحة والتعليم العالي في ليبيا وإنشاء هذا التخصص في المستقبل. بالإضافة إلى ذلك، تم عرض الخطوات اللازمة لتجاوز الوضع الراهن في ليبيا، وذلك استناداً على استعراض برامج استعاضة الوجه والفكين المعترف بها دولياً في أمريكا الشمالية، أوروبا، اليابان، وجنوب أفريقيا. هنالك خطتين ينصح بهما لإنشاء هذا التخصص في ليبيا؛ خطة عاجلة قصيرة المدى، وخطة مؤسسية طويلة المدى. تطبيق هاتين الخطتين من شأنه مبدئياً أن يدعم مقدمي خدمات استعاضة الوجه والفكين في علاج المرضى الذين يعانون من عيوب في منطقة الوجه والفكين ووضع خطط طوارئ لمتابعتهم والإشراف على علاجهم.

INTRODUCTION

Maxillofacial prosthetics involves prosthetic rehabilitation of patients with congenital and/or acquired defects and is a well-recognized subspecialty of prosthodontics in developed countries.¹ However, in both the education and healthcare sectors of many developing countries, maxillofacial prosthetics is less well recognized. Although Libya has a small population (6.22 million in 213)² and a relatively healthy economy with 4.3% GDP spending on health³, the status of maxillofacial prosthetics in Libya is similar to that of less developed countries as it is not recognized as a discipline or even a subspecialty. Since the Libyan conflict in 211, the incidence of gunshot and road traffic accident injuries has increased significantly due to civilian ownership of weapons and the absence of local law enforcement.^{4, 5} Consequently, more patients with permanent maxillofacial defects have created a need for maxillofacial prosthetic rehabilitation. Although some of these patients have received rehabilitation abroad, many others who were unable to receive prosthetic rehabilitation face living with functional, esthetic, and psychosocial impairments.

Beyond the scope of other dental specialists, maxillofacial prosthodontists provide a wide variety of prosthetic rehabilitation and therapeutic appliance services to patients with congenital and acquired defects⁶. More often maxillofacial prosthodontists have appointments at medical schools and/or hospital departments, such as head and neck surgery, plastic surgery, ENT, and oncology,⁷ and this provides them with access to various treatment modalities not normally available in dental practice. Maxillofacial prosthodontists also work in academia and conduct research in all aspects of maxillofacial prosthetic rehabilitation.

Maxillofacial prosthetic education plays a vital role in providing patients with maxillofacial defects access to specialists equipped with the appropriate attitudes, knowledge, and competence to apply their skills towards providing the most effective prosthetic rehabilitation treatment.⁸ A review of international education programs in maxillofacial prosthetics revealed that some dental schools offered undergraduate courses in maxillofacial prosthetics.⁹ Most postgraduate programs for maxillofacial prosthetic education and training involve a 3- to 4-year period of study in a structured program, except in the United Kingdom where there

is no specific clinical program in maxillofacial prosthetics¹. The British restorative dentistry program is a 5-year program that trains specialists in each of the disciplines of endodontics, periodontology, and prosthodontics beginning with 2 years of general professional training followed by 3 years of training in a prosthodontic specialty within restorative dentistry¹⁰. Its only reference to maxillofacial prosthodontics is that all trainees in all specialties should be exposed to diagnosis and treatment of patients with developmental and acquired abnormalities. With respect to clinical maxillofacial prosthetics, it is not possible to provide maxillofacial prosthetics without considering the technical support available.

To our knowledge, this article is the first to review the current status of maxillofacial prosthetics in Libya's sectors of health and higher education. The specific aims of this article are to provide a national perspective on maxillofacial prosthetics in a number of areas and to consider the steps needed to move beyond the current status quo in Libya.

SCOPE OF MAXILLOFACIAL PROSTHETICS

The head and neck region is one of the most important regions of the human body as it contains the oral cavity, eyes, ears, nose, and muscles of facial expression. Any defect in any one of these areas can negatively impact quality of life¹¹. Although surgical reconstruction is a first-line treatment option, it is not always possible due to the size or location of the defect, loss of surrounding anatomical structures, radiation therapy, or general health of the patient¹². Consequently, prosthetic rehabilitation is the only alternative treatment option available to patients¹³.

Maxillofacial prosthetics aims to restore function and esthetics to patients with maxillofacial defects using removable prostheses. Although the scope of maxillofacial prosthetics varies according to defect size and location, it can be broadly divided into intraoral and extraoral prosthetics. Intraoral maxillofacial prosthetics involves the use of mandibular and maxillary prostheses, while extraoral maxillofacial prosthetic rehabilitation includes the use of auricular, nasal, facial, ocular, and orbital prostheses. Simple intraoral defects tend to be treated with conventional prosthodontics. Partial loss of the mandible leads to a deviated path for opening and closing, and alteration of the occlusal

position due to the effects of the anatomical structures on the unaffected side results in an unstable prosthesis.¹⁴ The occlusal table or palatal ramp can be used in the maxilla to return a deviated mandible to an optimal maxillary-mandibular relationship.¹⁵ Maxillary defects can be functionally and esthetically rehabilitated using removable and/or fixed maxillofacial prostheses. In small defects, a one-piece maxillary obturator prosthesis can be used, whereas in large defects, a two-part prosthesis consisting of a hollow bulb obturator attached to a solid denture base can be used, especially if trismus makes it difficult to insert.¹⁴ Other prostheses used in the maxillary region include the palatal augmentation prosthesis (PAP) and palatal lift prosthesis (PLP). The former is used mainly for tongue defects such as glossectomy or tongue immobility, while the latter is used to elevate and obturate a collapsed soft palate in cases of soft palate defects.¹⁶

Auricular and nasal defects are difficult to treat surgically, so auricular and nasal silicone prostheses are typically the first line of treatment. Ocular and orbital defects are challenging because they involve complicated anatomical structures, particularly in orbital exenteration, which entails complete removal of the orbital contents, eyelids, surrounding skin, and soft and hard tissues.¹⁷ Ocular and orbital prostheses provide the esthetic rehabilitation needed to improve patients' quality of life. Various maxillofacial appliances can also be provided within the scope of maxillofacial prosthetics. They most commonly include an immediate surgical obturator for patients scheduled for tumor resection, radiotherapy appliances (e.g., molds, stents, protectors, locators, shields, carriers, and spacers),¹⁸ trismus-training appliances, and feeding plates for patients with cleft palate defects.

A multidisciplinary approach integrating various medical and dental disciplines is a key factor for successful maxillofacial prosthetic rehabilitation of patients with maxillofacial defects. Members of these disciplines work in close consultation and cooperation with each other and with the patient during all stages of treatment. As patients must be followed to ensure the effectiveness of definitive treatment, maxillofacial prosthetics remains a discipline of dentistry that often directs the course of treatment.

MAXILLOFACIAL PROSTHETICS EDUCATION

We reviewed various maxillofacial prosthetic education programs based in North America, Europe, Japan, and

South Africa to address what must be done to establish a new maxillofacial prosthetics program in Libya.

A study on the international educational status of maxillofacial prosthetics that surveyed 388 dental schools (response rate, 62%) found that 21% offered undergraduate teaching in maxillofacial prosthetics and 16% provided postgraduate courses.¹⁹ The North American maxillofacial prosthetics program is a highly structured program consisting of basic prosthodontic training for 2 years followed by 1 year of maxillofacial prosthetics training. This program is approved and accredited by the Commission on Dental Accreditation of the American Dental Association.^{1, 20} Some European countries such as Poland, Sweden, Switzerland, Turkey, and the UK formally recognize maxillofacial prosthetics within the specialty of prosthetic dentistry. Program length ranges from 3 to 4 years except in the UK, which is 5 years.²¹ In Japan, maxillofacial prosthetics is a highly structured program consisting of 4 years of training and research leading to a doctoral degree in maxillofacial prosthetics. South Africa also has a well-structured 4-year maxillofacial prosthetics program. Education in maxillofacial prosthetics varies among countries. Almost all programs tend towards the North American model in that they are established, highly structured programs of maxillofacial prosthetics. These programs have been adjusted to suit each country's needs with program periods that vary between 3 and 4 years.

CURRENT STATUS OF MAXILLOFACIAL PROSTHETICS IN LIBYA

Libya's health system provides health services to people of all ages through public and private health facilities. Libya has 96 public hospitals and 1,424 primary health care facilities.²² Many of these facilities are attached with dental clinics that provide basic dental treatment. None of the above mentioned facilities has a specialized maxillofacial prosthetic clinic or unit. Most patients with maxillofacial defects receive no rehabilitation or travel overseas to receive prosthetic rehabilitation, a situation that negatively impacts on patient well-being. Nonrehabilitated patients generally have impaired functions in areas such as speech, mastication, and swallowing as well as esthetic deformities and psychosocial problems. On the other hand, patients who have received prosthetic rehabilitation overseas face socioeconomic problems related to travel, living, and treatment abroad as well as physical exhaustion and fatigue.

The higher education system in Libya consists of public and private universities as well as higher polytechnic institutes. Among 12 public universities and two private ones, eight are public dental schools and two are private ones.²² Although undergraduate dental education at public universities is free, most dental schools do not have a postgraduate program. Therefore, a considerable number of students receive scholarships for postgraduate and doctoral studies at various international universities. Public and private dental schools offer a bachelor's degree in dental surgery upon completion of all dental courses and clinical training.

Although maxillofacial prosthetics is a well-recognized subspecialty of prosthodontics in many developed countries, maxillofacial prosthetics courses are currently not part of the undergraduate or postgraduate curriculum at Libyan dental schools. The current status of maxillofacial prosthetics in the country is exacerbated by the lack of education provided to undergraduates, whereas the other two subspecialties of prosthodontics -removable and fixed prosthodontics - are well represented and taught in all Libyan dental schools. The reason for this situation, however, is that there were fewer patients with maxillofacial defects in the past. Since the Libyan conflict in 2011 and the more recent conflict in 2014, the prevalence of maxillofacial defects has sharply increased, especially from defects resulting from gunshot and road traffic accident injuries.^{4, 5} As the demand for maxillofacial prosthetic treatment increases, the establishment of maxillofacial prosthetic clinics in association with dental schools is becoming necessity.

THE FUTURE OF MAXILLOFACIAL PROSTHETICS IN LIBYA

As maxillofacial prosthetics is an essential component of maxillofacial rehabilitation specialties, establishing a maxillofacial prosthetic discipline along with well-established disciplines such as fixed prosthodontics, removable prosthodontics, oral and maxillofacial surgery, and maxillofacial orthogenetic surgery in Libya would not only prompt participation in an interdisciplinary team approach, but would also ensure a steady supply of well-trained maxillofacial prosthetic educators and specialists that would benefit the profession and patients alike. Therefore, the time has come to move forward to formally establishing maxillofacial prosthetics in Libya. This following recommendations are aimed at establishing maxillofacial prosthetic practice in some dental schools in Libya. These recommendations are based on a review of maxillofacial prosthetic programs based in North America, Europe, Japan, and South Africa. Considering the geographic and epidemiologic factors related to patients with maxillofacial defects, the initial targets would be dental schools at the University of Tripoli, University of Misurata, Benghazi University, and Sebha University as they are situated in major cities. An urgent short-term plan and an institutional long-term plan are recommended for establishing a maxillofacial prosthetics program in Libya.

Urgent short-term plan:

The primary focus of this plan is to provide patients with maxillofacial defects urgently needed maxillofacial prostheses through remote overseas

Fig 1 Flowchart of proposed urgent short-term plan for maxillofacial prosthetic rehabilitation.

collaboration between the department of prosthodontics at the above mentioned Libyan dental schools and the maxillofacial prosthetic departments in developed countries such as Japan, the UK, and the US. With digital technology, this concept can be applied to provide defect patients with maxillofacial prostheses (Fig. 1). Patient data from computed tomography (CT), digital photography, and three-dimensional (3D) photogrammetry can be sent online as email attachments and/or upload/download cloud files to a maxillofacial prosthetics department in a developed country. (In the authors' case, the maxillofacial prosthetics department of Tokyo Medical and Dental University, Japan would engage in this plan). The received data allows for three-dimensional visualization, and the prosthesis can be designed and fabricated digitally and finished conventionally. The definitive prosthesis can be shipped to the department of prosthodontics of a Libyan university and then fitted. Online instructions and consultation can be provided during the prosthesis fitting appointment. A free internet-based audiovisual communication program such as Skype (Skype Communications SARL, Luxembourg, Belgium) can be used for this purpose. Online lectures and training can also be provided to young Libyan prosthodontics educators about maxillofacial prosthetic rehabilitation techniques. These actions would serve to gradually introduce the maxillofacial prosthetics specialty to Libyan prosthodontics educators and help establish an institution-based maxillofacial prosthetics program in the country.

Institutional long-term plan:

Establishing any new education or health-related program requires accreditation and approval from professional bodies to increase reliability. As for Libya, establishing an institution-based maxillofacial prosthetics program would meet a critical need. The recommended plan aims to establish maxillofacial prosthetic clinics in association with four dental schools that differ by geographic distribution and population incidence of defects. An internationally recognized maxillofacial prosthetic program can be used as a base and established to support health care professionals in managing maxillofacial defect patients. Specific information should be taught to undergraduate dental students by adding a course or subject to the current curriculum. However, emphasis should be placed on familiarizing undergraduate

dental students with the objectives and scope of maxillofacial prosthetic rehabilitation by providing details on the fabrication of various maxillofacial prostheses and appliances. This course or subject is essential for dental students to realize that appropriate treatment options for maxillofacial defect patients includes prosthetic rehabilitation, so that they can appropriately counsel and refer these patients. The ideal administrative structure for establishing an institutional maxillofacial prosthetic department would be affiliation with both a maxillofacial prosthetic clinic and laboratory for each of four dental schools and would be of great advantage to patients with maxillofacial defects. In addition, the department would administer teaching and research at both undergraduate and postgraduate levels. We suggest a 3-year postgraduate maxillofacial prosthetic program that emphasizes conventional prosthodontics as a foundation during the first year of the program. Students would then be gradually introduced to maxillofacial prosthetic rehabilitation as they gain expertise in conventional prosthodontics. The last year of the program would emphasize advanced maxillofacial prosthetic rehabilitation with advanced fixed and removable prosthodontics. As a clinical requirement, students must be capable of independent laboratory work. Therefore, they should supplement their clinical activities by performing all laboratory procedures. This suggested program would be the easiest approach to establishing a successful maxillofacial prosthetics program in Libya. In addition, the academic prerequisite to clinical practice and experience should be continuously reinforced with participation in literature reviews and seminars.

CONCLUSION

Maxillofacial prosthetics education and services have not yet been established in Libya's higher education and health sectors. There is an urgent need to establish such services on both a short-term and long-term basis, especially given the increase in gunshot and road traffic accident injuries. An internationally recognized model can form the base of the program and should be established in both sectors to support maxillofacial prosthetic providers in managing patients with maxillofacial defects and developing contingency plans for follow-up and maintenance.

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