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An Appraisal of the Complete Denture Situation

Total tooth loss

Perhaps the most fundamental question to ask in the first chapter of a book on complete dentures is: 'What is the demand for such treatment?' Fortunately, more and more evidence has become available to provide an increasingly accurate answer and one which enables future trends to be determined with reasonable confidence. Particularly notable are the series of in-depth studies of adult dental health in the UK that have succeeded in painting a detailed picture over a period of more than 30 years. There are also data from Sweden and Finland and parts of Germany that allow some statistical modelling of the current trends (Mojon et al. 2004).

The most detailed picture comes from the UK and the information that follows is based upon decennial surveys, the most recent one undertaken in 1998.

The situation at the end of the twentieth century

Whilst we await the publication of the survey outlining the state of adult dental health dur-

ing the first decade of the twenty-first century, let us first look at total tooth loss within adults in the UK in 1998 (Fig. 1.1) (Steele et al. 2000). Overall, 13% of all adults were edentate, and it can be seen that the condition was strongly correlated with age. Total tooth loss was a rarity up to the mid-forties age group, after which there was a steady climb to the age group 75 and over where the majority had lost all their teeth.

Total tooth loss is related not only to age but also to other variables such as social class and marital status. When multivariate analyses were undertaken, any association between tooth loss and gender disappeared. The differences that are apparent in the UK may be illustrated by comparing extremes. To quote from Steele et al. (2000), women from an unskilled manual background living in Scotland were 12 times more likely to have no teeth at all than men from a non-manual background in the south of England. Of those who had lost their remaining teeth in the previous 10 years, 59% stated that they visited the dentist only when troubled whilst 29% said that they had attended their dentist on a regular basis. This pattern of attendance was almost the complete

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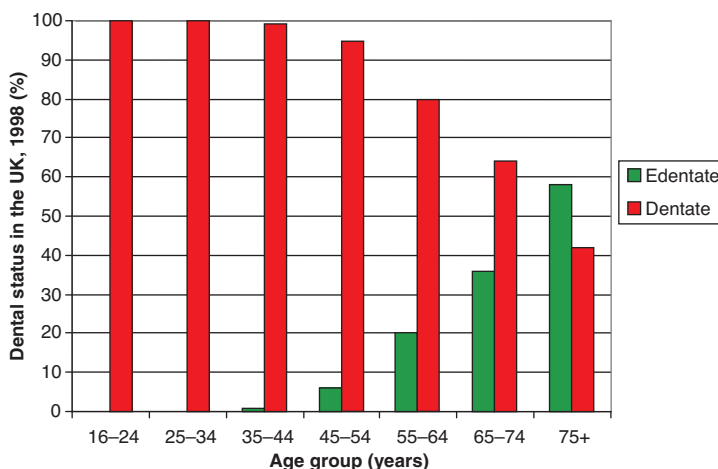


Figure 1.1 The proportion of dentate and edentate people, by age, in the UK in 1998 (with acknowledgements to Steele et al. (2000)).

opposite to that of people who still had their own teeth. What is of particular relevance is the change in the rate at which people lost their remaining teeth in the last 10 years of the twentieth century. It has been a much more gradual process than previously. Whereas in 1968 two-thirds of those who were rendered edentulous had 12 or more teeth extracted at the final stage, in 1998 the proportion had gone down to one-quarter. One possible reason for this change is that both patient and dentist wanted to keep some natural teeth for as long as possible. We are fully supportive of this philosophy and enlarge on the topic of transition from the natural to the artificial dentition in Chapter 3.

As people increasingly wish to function with their natural teeth rather than with dentures, one would expect mental barriers to be erected against the latter. This indeed appears to be the case when we consider that, in 1998, over 60% of those people who relied only on natural teeth stated that they would be very upset if they had to function with complete dentures. This attitude seems to have strengthened as we have moved into the twenty-first century. As the number of edentate patients falls, a 'tipping-point' appears to have been established, which results in a range of concerns being raised, including the social acceptability of

being edentulous. Whilst edentulism was previously thought to be almost inevitable, and thus an 'acceptable' option for patients with dental disease, this is no longer the case in many areas of society. As the number of edentulous patients falls, this smaller population becomes more manageable and allows the possibility for this group of people to be offered other treatments. For example, when there is little chance of maintaining a functional natural dentition, first-line treatment options have increasingly moved towards the preservation of some tooth roots and the use of overdentures. When this is not possible, then the use of implant-supported overdentures as the 'standard of care' has been proposed (Feine et al. 2002; Thomason et al. 2009).

These changes of emphasis on how one may manage the progression from the dentate state to complete dentures are important, especially as most of the complete denture treatment in the future will inevitably be undertaken on older patients. It is imperative that the dentist is aware of the various treatment opportunities, of the need to explore acceptable alternatives and to move into much longer-term treatment planning whilst the patients still have a functional dentition. This longer-term planning may be best regarded as treatment 'mapping' as

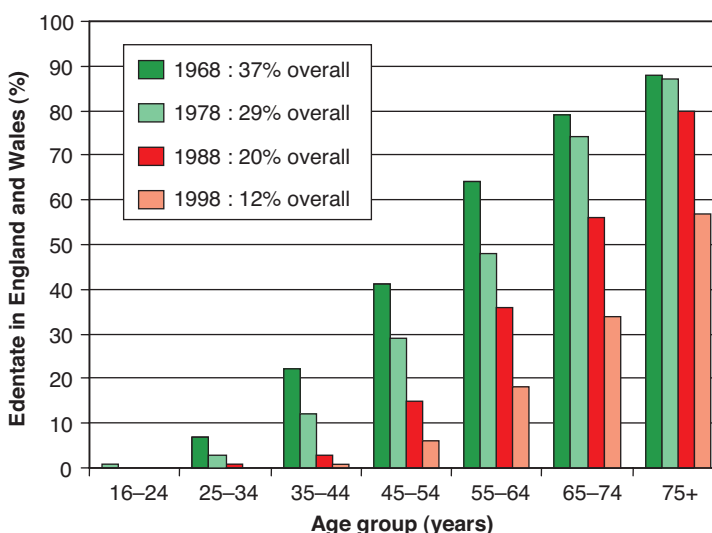


Figure 1.2 The relationship of total tooth loss to age over the period 1968–1998 (with acknowledgements to Steele et al. (2000)).

the absolute plan may need to be more flexible than is commonly the case in many treatment plans.

The past

So much for the ‘snap-shot’ of total tooth loss in 1998. A fascinating picture emerges when examining the trends that have developed over the 30-year period during which there have been four studies of adult dental health in England and Wales – 1968, 1978, 1988 and 1998. The relationship of total tooth loss to age is presented in Fig. 1.2. The first point to make is that dental health, as measured by total tooth loss, has improved dramatically. In 1968, 37% of adults in England and Wales had lost all their natural teeth. This figure had gone down to 12% in 1998. This improvement reflects the poor state of oral health before and after World War II when the main thrust of treatment, at the inception of the UK’s National Health Service, had to be an attack on the high levels of neglect, pain and sepsis existing in the community. Once this battle was won, the pattern of extractions and dentures gave way to a desire to restore the teeth and, eventually, to

prevent further disease. We are perhaps now seeing the next phase where alternatives and longer-term strategies of management and rehabilitation of what remains can be realistically considered.

The very high percentage of those aged 75 and over who had lost all their teeth at the time of the earlier surveys (Fig. 1.2) is of course a reflection of the high levels of dental disease many years earlier. For example, in 1968, 64% of all those in the age group 55–64 were edentate. That same group of people continued to lose their natural teeth until, 20 years later, 80% of them (now in the 75 and over age group) were edentate.

Referring again to Fig. 1.2, we can see how the huge improvement in oral health of the younger members of the population a few years ago is now influencing the figures as these people enter their middle years. Looking again at the 55–64 age group the percentage that had lost all their teeth has dropped from 64% in 1968 to 18% in 1998. More dramatic still is the reduction in the 45–54 age group – down from 41% to 6% in the same period. As these people grow older, it is reasonable to expect that they will, in 20–30 years time, bring down a lot further

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the current 57% of those 75 and over who are edentate.

The future

With the mass of information which has been accumulated over the last 30 years, it has become possible to predict future trends with reasonable confidence. If the current trends continue, it is calculated that, by 2018, only 5–6% of the UK adult population will be edentate; let us not forget, though, that 5–6% equates to four million people in the UK. We will need to wait for the results of the 2008–2009 UK Adult Dental Health Survey to see if the UK is still on course for these predicted improvements. On a more salutary note, it has been suggested that the effect of having an ageing population will mitigate against the rate of reduction in the overall prevalence of edentulism in the population. Indeed, in the US it has been predicted that far from decreasing, the need for complete denture treatment will actually increase over the first 2 decades of the twenty-first century (Douglass et al. 2002). The authors argue that the ageing 'baby boomers' will more than compensate for the falling prevalence of edentulism. Modelling these changes on European data has suggested that in the UK there will be a reduction in edentulism of the order of 60% over the first 30 years of the century, but it will then remain stable. The mean prediction for Finland follows a similar picture to the UK but the spread of the data is very wide and so is inconclusive (Mojon et al. 2004).

Total tooth loss in other countries

An investigation into the oral health of adults in the Republic of Ireland was undertaken in 1989–1990 (O'Mullane & Whelton 1992). The level of total tooth loss was very similar to that in England, Wales and Northern Ireland in 1988. There had been a considerable decline in the level of edentulousness compared with 10 years earlier.

Table 1.1 The percentage of people aged 35–44 years and 65 years and over with no natural teeth (data from WHO (1991)).

Country	35–44 years	65+ years
Albania	3.7	69.3
Czechoslovakia	0.7	38.3
Denmark	8.0	60.0
Finland	9.0	46.0
Ex-GDR	0.5	58.0
Germany, Federal Republic	0.4	27.0
Hungary	0.3	30.0
Ireland	4.0	49.0
Italy	0.3	18.0
The Netherlands	9.4	65.4
Norway	1.0	31.0
Romania	15.0	55.8
San Marino	1.3	40.7
Sweden	1.0	20.0
Turkey	2.7	75.0
United Kingdom	4.0	67.0
(Former) Yugoslavia	0.6	33.0

The relationship of total tooth loss to age is a worldwide phenomenon, as shown in Table 1.1, where the percentage of edentulous individuals for two age groups in a number of countries is shown. The amount of total tooth loss recorded in or around 1990 varies considerably between countries (WHO 1992). Whilst most EU countries do not have national survey data, in France a recent survey in the region Rhone-Alpes reported that in 1995, 16% of the 65–74 age-band was edentulous compared with 36% for the UK and 34% for the region of Pomerania in Germany (Mojon et al. 2004).

The prospects for the future may be summarised as follows:

- It is unlikely that the edentulous state will disappear, but there probably will be a fall in those requiring complete dentures so that there will be around 60% of the current number required.

- More people will retain a functional natural dentition into old age, but this dentition will not last a lifetime in all cases.
- As the public's expectations for oral health continue to rise, a larger proportion of those who lose their teeth will be very upset about the prospect of having to wear complete dentures and this will influence their response to treatment. Therefore, it will be critical to consider alternative treatment strategies for these patients.
- Most complete denture treatment will be centred on older people and is, therefore, likely to become more complex and demanding. The opportunities to consider retaining teeth as overdenture abutments or to provide osseointegrated implants as overdenture abutments for this group of patients are likely to increase and decisions will have to be made at an appropriate time in the planning cycle.
- Dentists will continue to need complete denture skills, which will have to be of a high order (Steele et al. 2000). Nevertheless, there will be less opportunity for the majority of dentists to practice these skills on a regular basis and some parts of this treatment provision are likely to move into the realm of the specialist.

In the remainder of this book, we endeavour to deal with all these points.

The limitations of complete dentures

The limitations of complete dentures are highlighted when one compares the difference between functioning natural teeth, intimately connected to and embedded in living tissues, with the removable prosthesis which replaces them, constructed of an artificial material simply resting on vital living (and often delicate) tissues. Between these two extremes is the complete overdenture. Whilst having many of

the characteristics of the conventional complete denture, it retains elements of functioning teeth in the form of roots. These roots retain a vital periodontal organ and are, therefore, intimately attached to and function with the alveolar bone. Support is provided through this intimate link with the rest of the body and retention can be provided through the use of attachments between the root surfaces and the prosthesis. A similar and better researched area of clinical practice is the use of the dental implant which provides support and retention for the complete overdenture. Clearly, once teeth have been extracted, the use of implants is the only way that overdentures can be made. However, before the last teeth are extracted, both treatment options remain available and the use of natural teeth as overdenture abutments is certainly a less expensive alternative than the implant-supported prostheses.

The resorption and prosthetic replacement of alveolar bone

It is of fundamental importance to remember that the extraction of teeth does not simply mean the loss of the visible crowns. With the loss of the roots, the surrounding alveolar bone resorbs. Whilst it is relatively simple to provide an effective replacement for the natural crowns with a denture, it is frequently difficult, or even impossible, to make good all the lost alveolar bone; the more bone that is resorbed, the greater is the problem.

Atwood (1971) described the continuing resorption of the residual ridges as 'a major oral disease entity'. It occurs in all edentulous patients and proceeds throughout life. Indeed, this would be a major argument in itself for retaining tooth roots as overdenture abutments in that their very presence will reduce the amount of alveolar resorption.

There is, though, considerable individual variation with respect to both amount and rate of loss of bone. Much has been written on the subject, and there has been a comprehensive

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Figure 1.3 (a) This complete lower denture covers only a small proportion of the available denture-bearing tissue and (b) as a consequence there has been increased resorption of bone and the imprint of the denture can be seen clearly.

review of the literature by Carlsson (1998). A single dominant factor responsible for ridge resorption has not yet been found. There are contradictory reports from investigations into the link between bone resorption and such factors as gender, duration of edentulousness, denture-wearing habits, quality of dentures and systemic influences.

What does emerge is an explanation that, in the early stages of edentulousness, the shape of the residual ridge and the amount of resorption is likely to be influenced particularly by local factors such as the inherent quality and size of the ridge, the technique used to extract the teeth, the healing capacity of the patient and the loads applied to the ridge (Xie et al. 1997a). An example of the latter is shown in Fig. 1.3a, where it can be seen that the lower denture covers only a small part of the area available to support it and, therefore, is not spreading the load sufficiently. This design error results in increased functional stress. The consequence is seen in Fig. 1.3b, where the imprint of the border of the denture can be seen on the residual ridge; the bone has resorbed and the denture has sunk into the underlying tissues. The 'sinking' denture illustrates one of the fundamental advantages of the use of an overdenture compared with a conventional com-

plete denture. Although there has been little conclusive research in this area, it is clinically apparent that supporting complete dentures on tooth remnants as overdentures reduces bone resorption. This may be assumed to be by transferring the usual compressive load of the denture through the mucosa into a tensional load within the periodontium.

It is suggested that the later stages of resorption in the edentulous are likely to be influenced more by systemic factors such as age, nutrition, drug therapy (e.g. corticosteroids) and hormonal factors. There is also a view that severe resorption, particularly of the mandible, is influenced more by systemic factors than by local factors (Xie et al. 1997b).

In spite of the gaps in our knowledge, there would seem to be a sensible way forward. Bearing in mind that a good foundation for complete dentures is such a valuable commodity, and that this foundation is capable of being damaged, it is important to take simple practical steps to reduce the risk. Therefore, the first step to be considered is maintaining some of the last few tooth roots prior to committing a patient to conventional complete dentures. Where this is not possible (and the use of implants as overdenture abutments is precluded), it is wise to encourage patients to reduce the loads on

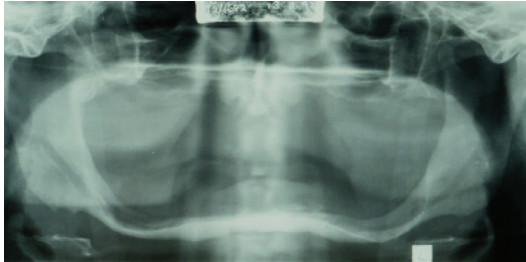


Figure 1.4 This orthopantomograph shows excessive resorption, particularly of the mandible.

the denture-bearing tissues by leaving at least the lower denture out when sleeping, and to ensure that there is no error in denture design which would promote undue resorption. Regular recall and maintenance are also very important so that any developing problems are identified at an early stage before serious damage has been done. All these factors are highlighted elsewhere in this book.

The radiograph reproduced in Fig. 1.4 is an example of extreme resorption; in simple terms, the mandible can be described as 'pencil-thin'. With the loss of skeletal bone comes the loss of support for the facial muscles resulting in the appearance seen in Fig. 1.5. It will be appreciated that to make good this huge volume of lost teeth and bone requires very large dentures. It can become very difficult for the patient to control such substantial foreign bodies. Having lost the opportunity to reduce the resorption by retaining some tooth roots at an early stage of treatment planning, the practical opportunity to avoid further bone loss by the use of osseointegrated implants may also have been lost, as the amount of resorption may no longer leave enough bone into which to place the implants. These plans need to be considered early in the planning cycle to be of maximum benefit.

Restoration of appearance

The limitations of complete dentures in restoring tissue loss, and thus supporting the lips



Figure 1.5 Excessive resorption of both jaws has resulted in a dramatic collapse of the lower portion of the face.

and cheeks fully, can contribute to an appearance of premature ageing in the edentulous patient (Fig. 1.6). The facial muscles may lose some of their tone through the ageing process, but loss of tone may also occur because the muscles are unable to function as effectively as before. This is because the underlying artificial supports (the dentures) are only sitting on the mucosa and are not attached securely to the rest of the facial skeleton. In fact, one can liken the difference in oral function between dentate and edentate individuals to that of a person striding briskly along a path rather than moving gingerly over a sheet of ice. The fact that the muscles need

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Figure 1.6 This sculpture of age and youth by Gustav Vigeland in Frogner Park, Oslo, illustrates the aged edentulous face well. Bone loss below the anterior nasal spine has occurred and is virtually impossible to replace with a complete upper denture.

a stable surface over which to function further strengthens any arguments in favour of the use of overdenture abutments whether as natural tooth overdenture abutments or in the form of dental implants. A series of studies from McGill University compared patient satisfaction with implant-supported overdentures compared with conventional dentures. Typically, scores for satisfaction with stability of the implant-supported denture were around 30% higher than those for conventional dentures (Thomason et al. 2003). Although there are no data for these differences with natural overdenture abutments, there is little reason to believe that they would be markedly different.

Mastication

Complete dentures certainly help in the control and breaking up of a bolus of food, but their chewing efficiency is considerably lower than that of natural teeth. This is due to the following reasons:

- Natural teeth are firmly attached to the surrounding bone, whereas dentures are merely sitting on the mucosa and, thus, must be actively controlled by the patient.

- The pain threshold of the denture-bearing mucosa is relatively easily exceeded so that the biting force, which is closely correlated with chewing efficiency of complete dentures, is reduced and may be only one-sixth of that of dentate patients.

Although a higher intake of essential nutritional factors is associated with an efficient natural dentition, the wearing of complete dentures does not mean that nutrition will be deficient. Modern food production methods technically enable an adequate diet to be obtained in a form that is readily assimilated despite the most inefficient dentitions. However, as noted later in this chapter, the situation may become critical within certain groups of older people.

Of particular importance is the fact that the enjoyment of eating depends upon the ability to chew, thus making the most of the flavour of the food whilst it is in the mouth. Furthermore, the sense of touch within the oral cavity enables us to distinguish the textures of different foods, a process which heightens the enjoyment of a meal. Such pleasure in eating encourages people to maintain an interest in food. If complete dentures are painful or if their control becomes a problem, eating a meal becomes a chore. In addition, coverage of the palate by the upper denture prevents the full appreciation of the texture and temperature of the food. People with complete dentures are thus more likely to lose interest in eating and switch from such things as meat, fruit and salads to less demanding foods.

People with a natural dentition have been shown to eat more fruit and vegetables than the edentulous. A patient's perception of limitations in chewing ability with complete dentures might be one of the factors influencing this dietary choice, but of greater importance might be the subject's attitude to, and knowledge of, the benefits of an appropriate diet. Indeed, simply improving the quality of a prosthesis does not suddenly cause an improvement in that patient's diet (Moynihan et al. 2000). It may well

be that the quality of the denture is important for the personal enjoyment of eating, but to have a good chance of improving the diet of denture-wearers psychosocial factors, as well as perceived chewing ability, must be addressed (Bradbury et al. 2008). There is clear evidence that to make this change a dietary intervention programme is required which ideally runs in parallel with the denture provision (Bradbury et al. 2006).

In spite of the limitations of dentures, the majority of patients manage well and are on the whole relatively happy to have a substitute for what may have been decayed, mobile and painful natural teeth. After all, it must be remembered that the most likely alternative to complete dentures is 'no dentures'.

There are, however, other alternatives that have been alluded to above; overdentures (over tooth roots or implants) or 'fixed' rehabilitations (bridges) constructed on dental implants. Many now regard overdentures supported by two implants to be the most appropriate minimal standard that should be offered to the edentulous in an affluent society (Feine et al. 2002; Thomason et al. 2009) – but there is a long way to go before this concept is universally accepted. There is only poor epidemiological data regarding the prevalence of dental implant treatment. It has been suggested that towards the end of the twentieth century, something like 1/1000 edentulous and partially edentulous patients had been treated using implant-supported prostheses (Carlsson 1998), and the majority of these are likely to have been in the partially edentulous. Sweden probably still has the highest penetration rate of implant treatment in the world (Carlsson 2006), but even here only some 8% of the edentulous population has received any form of implant therapy (Österberg et al. 2000), the other 92% being managed by conventional means. Whilst there is a better alternative to conventional complete dentures, there is still a long way to go before this alternative becomes the 'normal' treatment. The need for this change is clear and

exemplified by the observation that a significant number of people find complete dentures troublesome to the extent that, in one large national survey, over a quarter experienced difficulty in eating and drinking (Walker & Cooper 2000).

One of the fortunate consequences of these developments is that it is becoming increasingly rare that one meets patients whose misguided attitude towards dental disease is that the best approach is to have all the natural teeth extracted electively, when they are restorable, and be replaced by complete dentures. Indeed, bizarre as it now seems, only a few generations ago it used to be a common practice in some areas of the UK for this treatment to be carried out for a bride-to-be in the belief that it would reduce her future dental problems and would avoid saddling her new husband with major dental expenses! Fortunately, this attitude is no longer prevalent and there is rarely any justification for undertaking such a drastic step in early adulthood. Even though the first few years of edentulous life may well be relatively free of problems, it is impossible to predict whether an individual patient will retain an adequate bony foundation and maintain a satisfactory level of comfort and function, or will proceed to a state where denture problems significantly reduce the patient's quality of life.

The older edentulous patient

Earlier in the chapter, it was pointed out that the provision of complete dentures now, and even more so in the future, will largely be directed at the older patient. In recent years, a great deal has been written about this group of people. The purpose of this section of the book is to highlight some of the significant points that relate particularly to complete denture treatment. For a more detailed presentation of the topic, the reader is referred to the bibliography at the end of the chapter, which cites textbooks and papers that were used to compile this summary.

Demographic changes

The life expectancy of those in the developed world has been increasing at the incredible rate of 5 hours per day for the past 200 years. Therefore, it is hardly surprising that we are seeing a change in the age profile of our society, and with it a change in the expectation of those we used to call old. Studies of ageing have brought a generally accepted understanding that ageing is not programmed into each person but comes about by a lifelong accumulation of 'faults' in our cellular make-up. The events causing these faults can be affected surprisingly easily so that delaying damage by reducing exposure to events or boosting our defences will help to postpone the age-related decline which represents old age. This reduced exposure probably explains why the health of our older populations is so much improved – and indeed why the 'old' can now be described as the 'new middle aged'! The improvements in the conditions of our society in terms of housing, nutrition and working conditions may each have contributed to this reduction in accumulated damage and may also go some way to explain the life expectancy differences between better-off and economically deprived areas of our communities.

At one time, an 'elderly person' was commonly defined as someone over the age of 65. Many people have found this label faintly insulting even though the pill may be made rather sweeter if it is pointed out that the label is attached to those who are of pensionable age (Harkins 2002). The term 'older person' has become more acceptable and will be used throughout the rest of the text.

Throughout the world, the older population is growing rapidly. Figure 1.7 shows the proportion of the total population aged 60 years and over living in selected regions. The figures were produced at the World Health Organization (WHO) World Assembly on Aging in 1982. It can be seen that there is a big difference between areas which contain industrialised coun-

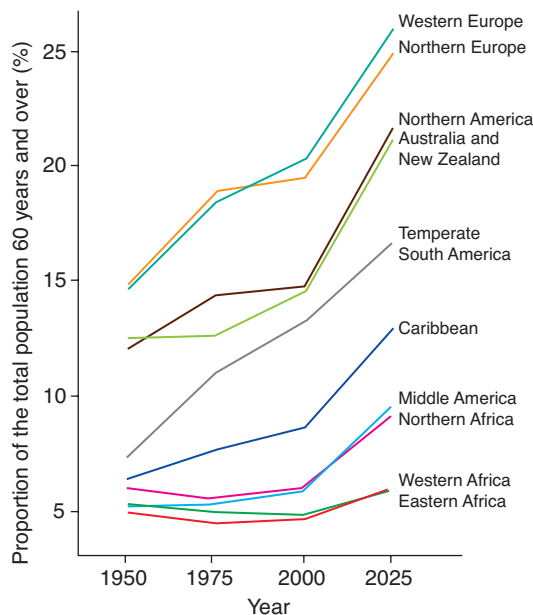


Figure 1.7 The growth of elderly populations in various regions of the world.

tries and those which are composed largely of less developed countries.

It is expected that in the first quarter of the twenty-first century more than a fifth of the population in industrialised countries will be over the age of 65. Those undergraduates reading this book will realise that most of their practising life will be influenced by this pattern. The proportion of edentulous adults in each age cohort will fall during this time, but the effect of the upwards shift in the age profile of our society associated with ageing 'baby boomers' will mean that the number of edentulous adults remaining in our society will remain significant (Mojon et al. 2004). In the UK, the proportion of older people in the population will continue to increase over the next 50 years. The effect of increased life expectancy on the population profile will mean that the greatest increase will be amongst those 85 years and over; their number will almost triple. The increase in the 65–74 and

75–84 age groups will be a little less dramatic (MacMahon & Battle 2002).

The vast majority of older and significantly older people live in the community. A small percentage, estimated at between 12% and 14%, are housebound because of physical or mental handicap. In Northern Europe, between 4% and 7% live in some form of institution. These figures are of particular relevance with respect to the delivery of care. Those people living in some form of institution do have the advantage that their carers are in a position to recognise problems and to seek advice on their behalf. Of course, this presupposes that the carers have some knowledge of prosthetic problems. Those older people who have some form of handicap and are living at home are perhaps the most vulnerable when it comes to dealing with prosthetic difficulties; frequently, the responsibility for initiating help and seeking treatment has not been accepted by any particular person. Valuable guidelines which cover the care of long-stay patients and of those who need treatment on a domiciliary basis have been published (Fiske & Lewis 2000; Fiske et al. 2000).

Some changes seen in older people

This section describes some of the more relevant changes that occur in older people.

Older people typically remain alert and continue to have sound judgement; however, a modest decrease in mental agility occurs. With increasing age there is often seen slight impairment of the abilities to learn and to memorise. With increasing age, there is a progressive loss of neurones and synapses in the cerebral cortex. As a result, there is a slowing of the central processing facility with a consequential lengthening of reaction times and response to sensory stimuli.

Within the sensory system, age brings about a deterioration of the senses of smell and taste, the former being more affected. Hearing is im-

paired in approximately 25% of people over the age of 65 years and in 80% of those in the age range 75–79 years.

With respect to the motor system, there tends to be impairment of balance and some postural tremor, indicating deterioration of cerebellar function and of the extrapyramidal system. With increasing age, there is less precision in controlling the contraction of muscles, such as the masseter muscles. It takes more time and efforts before new dentures can be controlled automatically. Of course, an older person has a great deal of experience to fall back on, and if a new task is given, which utilises previously acquired skills, difficulties will be minimised. However, problems are more likely to arise if the new task is more demanding than declining abilities are able to cope with. For example, previous denture experience can be of the greatest assistance when having to cope with new dentures, providing that major changes to the design of the dentures have not been introduced (see Chapter 8).

Research has shown that the masseter and medial pterygoid muscles suffer a decrease in cross-sectional area and in muscle density as a consequence of advancing age; the decrease is more apparent in edentulous people (Newton et al. 1993). Such changes might, in individual cases, be responsible for complaints of difficulty in eating and of eating more slowly than the rest of the family. Of course, these problems can be due to the simple fact that eating with dentures is just more difficult than eating with natural teeth anyway!

Age also brings about deterioration of the denture-bearing tissues. The epithelium becomes thinner, the connective tissue is less resilient and the ability of the mucosa to heal is impaired. Osteoporosis is a common problem in older people, particularly affecting postmenopausal women, occurring in about one-third of women over 60 years. Not only is the skeleton affected, but the lower jaw will also show a decrease in bone density. The severity of osteoporosis is related not only to hormonal

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changes but also to long-term calcium deficiency and to loss of normal function. There is no evidence to suggest that the rate of salivary secretion decreases with age per se, but as will be seen later, normal salivation can be adversely affected by drug therapy.

Systemic disease

The following problems, which commonly occur in older people, can cause complications specifically related to the care and treatment of the edentulous patient.

Psychiatric disorders

Depression is the most common mental disorder in later life. The prevalence of depression requiring clinical intervention in the over 65-year-olds is between 13% and 16% (Banerjee et al. 2002). This condition can result in poor appetite and weight loss and can adversely affect motivation and self-care. It is not a normal consequence of ageing and is treatable. With regard to prosthetic treatment, the condition may reduce the patient's ability to make an effort to accommodate to new dentures.

Dementia is found in 5%–6% of people over the age of 65 and in 20% of those over 80 years old and can result in conditions such as intellectual impairment, a poor memory (particularly for recent events), poor concentration and a reduced level of self-care. The situation can deteriorate to such a level that dentures, particularly the lower, cannot be worn.

Additional problems may arise from the drug therapy given to these patients; they are discussed in the next section and in Chapter 16.

Parkinson's disease

This condition, as well as other tremors that are likely to occur in the older person, can adversely affect the precise control of the mandible, making it more difficult to obtain an accurate recording of the jaw relation-

ship. Parkinsonism can also cause difficulty in swallowing, leading to pronounced dribbling, which can be very distressing for the patient.

Cerebrovascular accident

The occurrence of a 'stroke' may result in unilateral paralysis of the facial muscles, making it more difficult for the patient to control dentures, especially the lower denture. The patient may also have difficulty clearing food which has lodged in the buccal sulcus. Speech may be affected, making it difficult for the patient to communicate with the dentist. Ways in which prosthetic treatment can help these patients have been described by Wright (1997).

Angina

Angina can cause pain that is experienced around the left body of the mandible or even the left side of the palate. This usually occurs in association with chest pain and the onset is usually related to physical exertion.

Congestive heart failure, chronic bronchitis and emphysema

Older patients with these conditions are likely to become breathless if the dental chair is tipped back into the supine position.

Diabetes

Type 2 diabetes occurs commonly in later life. It predisposes to infection in the mouth by *Candida albicans*, is a cause of a 'burning mouth' and can result in troublesome dryness of the oral mucosa.

Osteoporosis

Although this condition has already been mentioned with respect to the denture-bearing tissues, it is appropriate to mention that it can lead to a hunched posture, or kyphosis, which

requires the dentist to ensure that work is undertaken with the patient in the sitting position with the head and neck adequately supported.

Arthritis

Older patients may suffer from osteoarthritis or rheumatoid arthritis. Either condition may have reached such an advanced state that the patient finds it extremely difficult, or even impossible, to attend the dental surgery. If either of these conditions affects the hands, it becomes increasingly difficult for the patient to clean dentures adequately. The patient can be helped by increasing the thickness of the brush handle so that it can be gripped without discomfort, by providing brushes which can be attached to a washbasin and by recommending an effective cleansing solution which reduces the reliance on mechanical means of plaque removal.

Nutritional deficiencies

Deficiencies of the vitamin B complex, folic acid and iron are not uncommon in the older person. As will be described in later chapters, these deficiencies can lead to pathology of the mucosa and to widespread discomfort or burning.

Drug therapy

It has been reported that older patients are prescribed an average of 2.8 drugs per person. Poor compliance with medication is found in between 50% and 60% of patients; this is a particular problem among older people who are of course taking more drugs and may have some degree of intellectual impairment or poor recall.

The commonest drugs prescribed for older people, in descending order of frequency, are diuretics, analgesics, hypnotics, sedatives, anxiolytics, antirheumatics and beta-blockers. Many of these drugs have side effects that are relevant to the dentist about to undertake prosthetic treatment. Xerostomia is produced by certain antidepressants, diuretics, antihyper-

tensives and antipsychotics, with some drugs having a more profound effect on secretion than others. Lack of saliva adversely affects the retention of dentures, increases the possibility of oral infection, and through the absence of lubrication, can result in generalised soreness or even a burning sensation.

Certain drugs, such as steroid inhalers used in the treatment of asthma, immunosuppressive drugs and broad-spectrum antibiotics used over a long period, can alter the oral flora, thus predisposing to candida infection.

Tardive dyskinesia is a condition characterised by spasmodic movements of the oral, lingual and facial muscles. These uncontrollable movements can make it extremely difficult, or even impossible, to provide stable dentures. The condition is brought on by extensive use of drugs such as antipsychotics and tricyclic antidepressants. It will occur in 20%–40% of patients who have been taking the drugs for longer than 6 months. In approximately 40% of sufferers, the condition is not reversible, even if the drug therapy is stopped.

Psychological changes

Advancing age leads to certain inevitable changes that must be taken into account when treating older patients. For example, the patient finds it more difficult to perform tasks that depend upon rapid movements. Such tasks may well include the need to suddenly control a denture that has become destabilised during normal function. It should also be realised that older people take rather longer to learn to perform new tasks or to remember new information which is not put over clearly or which may not appear to be immediately relevant.

As mentioned earlier, depression is a common condition. One frequent cause is the changing role brought about by increasing age. For example, children are no longer dependent upon the parent, retirement brings about a new life with reduced income, life changes dramatically as a result of the death of the spouse,

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health deteriorates and the person is less able to care for him or herself. The greater the number of these life events, the more the person has to cope with. Of course, if the person is able to adapt to the changes, there is a reduced risk of depression developing.

Older people are less able to accept new situations, be they a change in denture shape, a new dentist or even the appointment time for treatment. It will be appreciated that the clinician must take many aspects of the life of the patient into account when investigating a complaint. Of course, many problems will be straightforward, but some will be complicated by factors that are far removed from the oral cavity and the existing dentures. Unless their presence is suspected, there is a risk that prosthetic treatment alone will fail to deal with a problem (see Chapter 16).

Nutrition

A great deal has been written on the relationship between nutrition and the efficiency of the dentition, be it natural or artificial. It is not appropriate in this text to rehearse all the arguments. Instead, some of the more important conclusions will be listed.

Although overt malnutrition is relatively rare, it should be pointed out that an inadequate diet can lead to reduced tolerance of the oral tissues to normal wear and tear and that this reduced resistance, in turn, can result in poor adaptation to dentures. Those people more likely to have nutritional problems are the housebound living at home, those with handicaps that make shopping and cooking difficult, alcoholics, people who suffer from mental illness or those who have been recently bereaved. As indicated below, those living in long-stay institutions are a particularly vulnerable group.

Our knowledge of the link between oral health, diet and nutritional status in older people has been improved by the publication of a national diet and nutrition survey of people aged 65 years and over (Steele et al. 1998). In

this survey, comparisons were made between those people living at home (the free-living sample) and those in long-term care (the institutional sample). Findings that relate particularly to edentate people are as follows:

- Fifty per cent of the free-living group were edentate as compared with 79% of the institutional group.
- Those living at home wore old dentures with a mean age of 17 years. The complete dentures of the institutional group were older still and had more faults.
- Edentate people reported greater difficulty in eating certain foods than did the dentate. These foods included tomatoes, raw carrots, lettuce, well-done steaks, apples and nuts. The difficulties could be so great that the foods were not eaten at all. Those people who reported dry mouths had greater difficulties with those foods which required chewing. Those living in institutions reported significantly greater restrictions.
- Edentate people had lower plasma levels of vitamins A, C and E than the dentate. Those living in institutions had a disturbingly low level of vitamin C that was at the bottom end of the normal range.

Finally, the point should be made that, in the absence of an effective dentition and an adequate supply of saliva, there is a greater risk of a person choking on a large bolus of food that has not been adequately broken up. Preparation for safe swallowing is an important consideration.

The condition of dentures

Most edentulous people over the age of 65 years are wearing dentures that are more than 10 years old, and as a result, mucosal changes are present in between 44% and 63% of cases. The need for treatment, based on clinical judgement, suggests that 40% of 5-year-old dentures and 80% of 10-year-old dentures should be

replaced. However, the picture is not that simple. Need can be measured in a variety of ways:

- 'Normative need' is the need defined by expert or professional opinion.
- 'Felt need' is the patient's subjective desire.
- 'Expressed need' is recorded when the 'felt need' is activated through the patient seeking treatment.

One estimate of 'normative need' has already been described. Others indicate that 70%–85% of older people's dentures require attention and that such need far exceeds the 'expressed need'. Older people are likely to consider that treatment is required as a result of experiencing pain, difficulty in chewing, a deteriorating appearance, or because the existing dentures are broken or have been lost. However, the 'felt need' may not be activated for a variety of reasons, including the following:

- The dental problem is low on the list of priorities compared with other problems.
- Inertia on the part of the patient.
- Ignorance of available services.
- Fear of treatment that may be required. It is important to remember that a large proportion of today's edentulous patients experienced dental treatment in less sophisticated times when pain was a frequent accompaniment.
- Inability to travel to a surgery because of ill health or problems of transportation.
- A feeling that nothing can be done anyway and that the dental problem is just one of the inconveniences of old age.
- Finance.

The effectiveness of some or all of these 'barriers to care' can be gauged from one survey which reported that of a group of 75-year-old people living independently, nearly half had an oral problem, one-third had pain and the majority had not visited a dentist for at least 10 years, and what's more, did not plan to do so.

Caring for the older patient: some practical points

Many of the subsequent chapters of the book refer to modifications to clinical techniques or approaches that may be required to meet the particular needs of the significantly older patient. When dealing with these significantly older patients who may be frail, all members of the surgery team must have a sound understanding of the problems of this older group and be sympathetic to their needs. The sections which follow mention some aspects of management that naturally follow on from the previous discussion.

Mobility

There are many causes of immobility, which may arise from disorders of the musculoskeletal system, neurological disorders, cardiovascular and pulmonary disease, the consequence of drug therapy and psychological problems. The whole story for an individual patient may be quite complex and the consequences may be far reaching. For example, a person's immobility may result in depression, which itself causes loss of appetite, and ultimately, malnutrition (Walsh et al. 1999). It requires little imagination to realise that the added complication of poorly fitting or painful dentures can only worsen the situation.

It should be stressed that to encourage older edentulous patients to attend for dental treatment, it is important to ensure that there is ready access to the surgery. A ground floor location is ideal, and both doors and corridors should be wide enough to provide access for wheelchairs. Once the patient has arrived in the surgery, sufficient time needs to be spent explaining the routine in order to put the patient at his or her ease. When settling the patient in the dental chair, it is important to warn the patient in advance of any movements of the chair that are about to be made and to remember that

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most older people will be more comfortable in the sitting rather than the supine position.

Communication

It should be recognised that the patient is likely to be anxious and also unclear as to what might be involved at the first visit to the surgery. It is imperative to develop appropriate communication skills so that the patient's problems can be assessed as accurately as possible, a realistic treatment plan evolved, and the patient made fully aware of what will be done and more particularly what may be the limitations of treatment. To this end, it is vital to carry out the discussion in a quiet, unhurried environment, to face the patient when talking and, if the patient has a hearing impairment, to speak slowly and clearly but without undue exaggeration. As the impairment is likely to mean that higher frequencies can no longer be perceived, it is important not to speak too loudly. It is also extremely important to allow plenty of time for listening to the patient's account of any problems so that he or she feels that sufficient opportunity has been given for matters of concern to be adequately explained to the dentist.

When information is being given to the patient, it should be relayed reasonably slowly, in a carefully structured manner, and without distraction or interruption. It is useful to back up verbal comment with written advice, recognising that the print should be large enough for those whose eyesight has deteriorated.

When obtaining a history, it is important to remember that older people have an increasing number of 'aches and pains', but regarding these problems as being a normal consequence of ageing can result in a risk of under-diagnosing. It must also be appreciated that chronic pain and depression commonly go together, so it is important to establish any predisposing factors. For example, widespread pain under a lower denture might be due to a clenching habit which has bruised the mucosa, and which has been initiated by worry at home;

the pain is no less real, whatever the cause. In such circumstances, prosthetic treatment on its own is unlikely to offer long-term success. Effective care is likely to require communication between the dentist and the patient's medical practitioner.

Planning treatment

When deciding upon a course of treatment for an older patient, one must always have the original complaint at the forefront of one's mind and plan a programme of care that can be achieved in the particular circumstances. For example, the request to see the patient may come from a relative who has become increasingly embarrassed that dentures are not being worn on social occasions. The health of the patient may have deteriorated to such an extent that successful control of a new lower denture is clearly out of the question. It may be concluded that realistic treatment is the provision of an upper denture only, which will be worn for appearance's sake rather than for function. In such circumstances, it can be argued that the dentist is treating the relative as well as the patient, a course of action that surely is entirely justified. Although this particular illustration may be thought of as an extreme one, it is by no means uncommon in long-stay care homes and does serve to make the point that successful treatment is the 'art of the possible'.

Postscript

In this section of the chapter dealing with the older and significantly frailer patient, we have drawn attention to conditions that are likely to influence overall care. The reader should not progress to the remainder of the book with the impression that prosthetic treatment of the older patient is invariably going to be complicated by a long list of problems. It is important to put things in perspective by appreciating characteristics of normal ageing. Many of these characteristics are widely recognised but some

have been less well accepted. Certain features that are well recognised include the following:

- The majority of older people are *not* senile, nor do they feel miserable for most of the time.
- Most older people can learn new things.
- Older peoples' reaction times tend to be slower.
- Physical strength tends to decline with age, but about 80% of individuals are healthy enough to carry out normal activities.
- The majority like some kind of work to do.

Those features which are less well recognised include the following:

- All five senses tend to decline with age.
- Most older people are not set in their ways; they do, however, take longer to learn something new.
- The majority are seldom bored and are neither socially isolated nor lonely.
- The majority of old people are seldom irritated or angry.

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