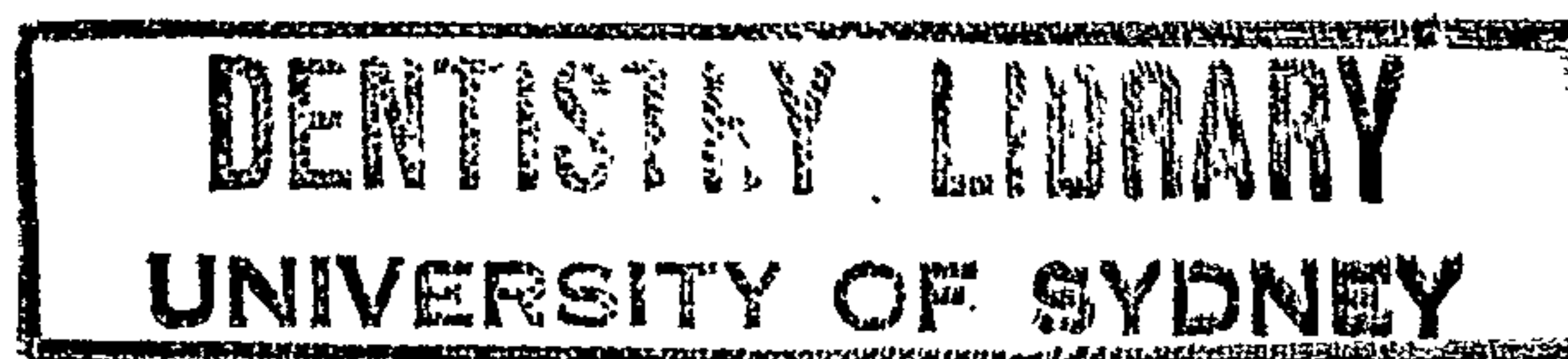


**PREVENTIVE AND INTERCEPTIVE ORTHODONTICS**  
**IN RELATIONSHIP TO THE**  
**SCHOOL DENTAL SERVICE**  
**AND THE**  
**STATE ORTHODONTIC SERVICE IN N.S.W.**

3

TREATISE PRESENTED IN PARTIAL FULFILMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF MASTER OF DENTAL SURGERY.



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## INTRODUCTION

### INTRODUCTIONS

Under present conditions of Government funded Dental Services in N.S.W. general Dental practitioners who are either School Dental Officers or Hospital Dental Officers supervise the development and treatment of childrens' dentitions. It is estimated that 20% of children in this State attend the School Dental Service (1), the remainder go through the private Dental System or have no treatment at all. Those Dentists who work in the Government funded clinics of necessity are faced with problems of an orthodontic nature in their everyday work. A knowledge of diagnosis of orthodontics and experience in preventive and interceptive orthodontic measures would be of assistance to these officers if they wish to operate an adequate Pedodontic Service.

In the School Service, children's perceived needs are discovered by a sifting process. When children first attend a clinic, in most cases their first assessment is done by a School Dental Therapist. The Therapist decides whether the child will be treated solely at her level or whether the child will be referred through to the Dental Officer. This decision embraces not only difficult work, pathology etc. but also orthodontic need. It has to be realized that this initial screening is done by the member of the Dental team who has the least training of all.

Many people ~~may~~ feel that this screening should be done differently with more highly trained operators sorting out those ~~patients~~ patients who have various problems including orthodontic ones and then the decisions concerning these patients' treatment made by those best capable of doing so. If there were sufficient staff to screen all the children at least at experienced Dental Officer level, it would be satisfactory but in fact due to staff shortage the initial screening is done at Therapist level.

In practice the screening process works quite well as Therapists, experienced in recognizing the normal, quickly identify the abnormal. In orthodontics this is assisted by the unerring eye of the patients' mothers. These possible future orthodontic candidates are then assessed by Supervising Dental Officers who in turn make a preliminary decision using a screening process. This would embrace urgency and priority need for treatment in free clinics.

At this stage in the School Service there is a division between those who can seek treatment on an almost immediate basis and those whose treatment will eventually be decided by the funds and manpower available through the State. If a parent wishes a private referral urgent problems can be dealt with immediately, parents' fears coped with and the child treated at the most ideal time for that child. Children whose parents' income is at Social Security card level are referred to the State Orthodontic

Services. There the resources are limited and waiting lists necessary. In fact a directive to Supervising Officers states that only patient/parent initiated enquiries should be the basis for State referrals apart from "acute" need. This places the officer in an invidious position. At this stage in school clinics because they are free, the Social Security status of a patient is not known and it could also alter over the years of treatment whereas in the Dental Hospitals all patients are card holders though children under 15 years are entitled to free treatment. A Dentist should try to attend to each child regardless of status to the best of his ability and a discussion of an orthodontic situation would surely be part of such attention. To ignore such a situation would be hard to defend professionally given a person can sue for insufficient advice or attention for seven years after reaching eighteen years. Apart from parents able to afford private treatment and those eligible for Government funded treatment, there is a big group of children who never receive treatment as family circumstances make it impossible.

It would ease the demands of these sections of the community if Supervising Dental Officers could perform some preventive and interceptive orthodontics. In view of this it would benefit to scrutinise the nature of preventive and interceptive orthodontics and how it might help in individual dental care.

Preventive Orthodontics could be defined as any action taken to preserve normal development in a child's dentitions. (2)

Interceptive Orthodontics or secondary preventive orthodontics could be defined as any procedure that eliminates or reduces the severity of a developing malocclusion. (3)

There will be implications in the demands of this level of care for Supervising Dental Officers who have to deliver this service. This will be reflected in a detailed assessment of possible clinical situations that fall within the ambit of a plan for interceptive orthodontics. There may be difficulties in defining where interceptive orthodontics stops and corrective orthodontics starts. In turn this will raise the arguments always present in orthodontics as to what type of decisions in diagnosis can be safely made in relation to the expertise of those making them. (4) To answer such questions the graduate and post graduate training of those caring for children should be looked at. Updating of skills is not compulsory for Dentists and Community Service Dentists may be asked to take on supervision of the school clinics when they have had very little experience in this field and their degree may be of many years standing. A service is only as good as its Supervising Officers and perhaps an in-service training course should be available and

probably mandatory. (5) (6)

It would be helpful to examine the needs and expectations for children especially those of school age who depend on clinics which are Government funded. All Government Dental Services face the same problems where demand for services may outstrip the finance available and the skilled personnel to deliver it. This in turn, especially in orthodontics, brings in the considerations of who then will receive treatment. (7) In Government school clinics for some years now there has been little direction under the decentralised Hospital System in regard to service options generally.

However this situation could be discussed in relation to the School Dental Service in New South Wales and to the problems it faces in delivery of orthodontic services to an increasingly demanding population. There could be a discussion of the ability of the service to attract to its work force Dentists of high pedodontic standards. The diversity afforded by the practice of interceptive and preventive orthodontics could well be an incentive i.e. benefits.

Following will be the detailing of such treatments as would come under the scope of preventive and interceptive orthodontics, the advisability of such treatments and the pitfalls that could be awaiting those with a limited amount of expertise and experience. (8)

The discussion of interceptive orthodontics will

include:

- Areas of application, their simplicity and levels of expertise needed. This would include screening.
- Evaluation of various common conditions and subsequent procedures. This should be in relation to the level of benefit to the patient (9) and the subsequent cost benefit. The implications of such an analysis may well be not in favour of a great deal of treatment in the mixed dentition. (10)
- The time involved in procedures.
- The length of appointment time needed for such treatments.
- A discussion of the risks involved in such interceptive treatments.
- A discussion of conditions ranging from those in late primary to early permanent dentitions.
- Utilisation of specialist advice.

The Government funded orthodontic services have an inherent obligation to be available to those who need them. This is not an easy task to deliver. There are difficulties in delivery of services in the cities increased by the urban sprawl but these difficulties are magnified in the country areas. In a State like New South Wales huge distances make it hard. The State Orthodontic Service is trying to give access to disadvantaged people by bringing skilled personnel and

equipment to inland centres on a rotational basis.

This also provides an extension of expertise and consultation to local Dental Officers. The private sector Orthodontists have already a networking of services in country areas and it might be possible through funding to utilise their services as Visiting Dental Officers. There are also several other orthodontic services which have targeted special need areas in N.S.W. One is the Aboriginal Service at Redfern which includes orthodontic services in its medical services. Services in more remote places still like Broken Hill and the outback would really be itinerant. Such tertiary level care as orthodontics would be prohibitively expensive and as a non-life threatening elective would be difficult to justify.

Services such as these make accessibility to treatment a realistic proposition for many more people.

**SCREENING OF CHILDREN  
IN THE  
NEW SOUTH WALES SCHOOL DENTAL SERVICE  
FOR  
ORTHODONTIC PURPOSES**

**SCREENING OF CHILDREN IN RELATION TO MALOCCLUSIONS**

The School Dental Service at this time in N.S.W. has a clientele who range in age from four and a half years of age to about thirteen years. This age grouping is particularly significant from an orthodontic aspect. (11) Children move from an intact deciduous dentition, through the mixed dentition to in many cases the complete permanent dentition with the exception of the third molars. It is in the mixed dentition that many orthodontic problems begin to manifest themselves. Some of these problems will be simple ones which with preventive care may still allow a normal dentition to develop. Other problems may well require interceptive orthodontics to allow normal development and still others will show the signs of developing malocclusion.

A screening service for children using the School Service should be planned as to how and when this may be most effective in determination of orthodontic need. (12) It has also to be borne in mind that children possess parents, who may well want answers as to perceived abnormalities in their offsprings' teeth. (13) These answers have to be provided when parental anxiety demands it, regardless of policy decisions and guidelines. Otherwise parents simply remove their children from the School Service convinced that their needs are not being met or if they have to remain, as a dissatisfied group. (14) Screening of an inflexible

nature would obviously not meet this need.

There are different ways of approaching the need for orthodontic assessment and also there is the question of who is to do it and the levels of expertise that may be necessary.

In private practice a Dentist will observe and assess each child and its orthodontic needs on a regular basis and his level of expertise would probably ensure that whatever was necessary either in treatment or referral would be done at an appropriate time. (15)

In the School Service it becomes more difficult as the bulk of the dental care is delivered by a Dental Therapist who does not have the level of expertise of the Dentist. Their narrow, essentially practical training works reasonably well with a defined scope but not beyond. Against this the Therapist sees only children and a great number so they become adept in picking out the abnormal.

The question then arises as to how to distinguish from the normal dentitions, those that will require care and observation.

Does the service rely on the least trained personnel to determine on what child and when an assessment should be done?

Does or should the service use its Dentists to determine this by a systematic screening of all children at certain ages? (16)

Should Specialists be used to make decisions on

children who have orthodontic problems and who may not yet be in the permanent dentition?

What about parents who have perceived ideas of their children/s needs? (17)

If children are only referred in the permanent dentition to Orthodontic Departments, the delivery of preventive and interceptive orthodontics would have to be carried out by the Dental Officers who in turn would need more than undergraduate training and perhaps a backup service to whom they could turn for advice with, models, photos, histories etc. (18)

The delivery of pedodontic care with its subsequent orthodontic responsibilities is complicated in N.S.W. by the fact that general dental care in the School Clinics is free and open to all income groups but specialist services are means tested. This is characteristic of the Health Care system generally, particularly in regard to hospitalization. This means that only a small proportion of children will eventually be treated by the State for orthodontics while the rest will either not be treated or treated by private specialists as their parents can afford or give such cost a priority in family finances.

This group which has to seek treatment outside Government funded clinics has a completely different need criterion basis. Some children with minor defects will have considerable money spent on them to rectify these while others with major problems will have

nothing done because it ranked low in family priorities. (19) Many of these children are from low income families who would be just above Health Care Card status. A wider delivery of interceptive and preventive orthodontics would benefit this group if it came within the general work of the clinics and the School Officers providing it. There is a presumption here that such treatment would be adequate.

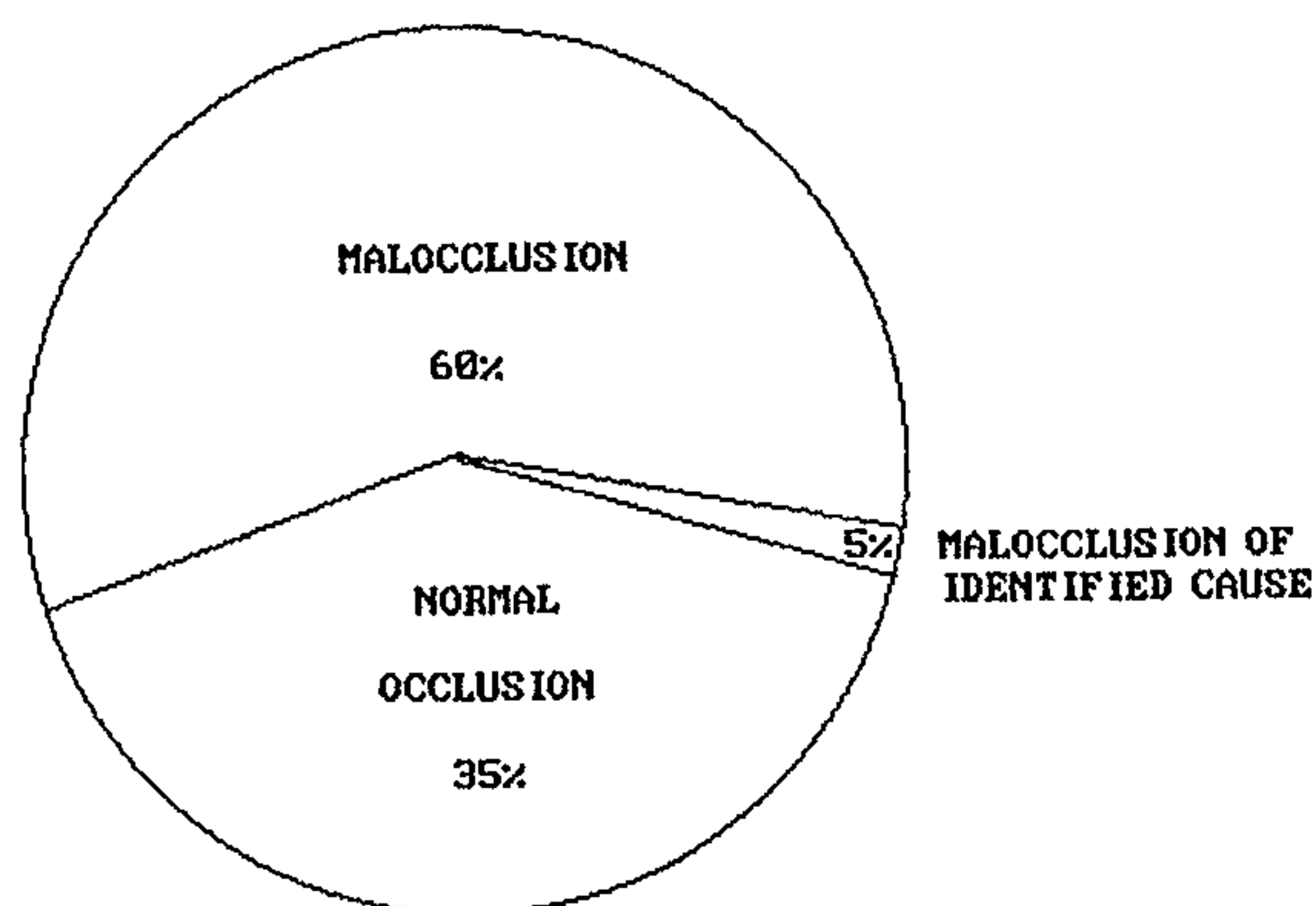
Specialists themselves vary enormously in their attitude to those Dentists who have screened out possible preventive and interceptive orthodontic cases and wish to attempt to treat them. Some may be supportive and helpful and perhaps be willing to suggest treatments, others may feel that compromise treatment is a professional sellout and that those who receive treatment should receive only the best with maintenance of high standards but of course with lesser numbers of people being able to benefit from the overall resources of funding and manpower.

From this background a system of dealing with patients with orthodontic problems has to be devised.

Perhaps such a one as the following might be acceptable in our State.

(1) The Role of the Dental Therapist

The Dental Therapist sees many children within a specified age group i.e. 5-12 years of age. In this group of children, (20) 40% will have normal occlusion, 5% will have a malocclusion of identifiable cause and 60% will have some malocclusion of unknown cause i.e. as applied to Western European peoples



This 65% of potential malocclusions have to be identified from the normal by the Therapist. As her dental education has been specifically designed to treat mouths with minor problems perhaps a simple card with a checklist could be designed and against this her decision to refer higher up the scale could be made.

(21) A checklist for children up to about nine years of age with an appendix to be included for children 9-12 years.

Possible checklist to be applied up to 9 years of age.

This would be designed to pick up already present

difficulties which could well fall within the sphere of interceptive and preventive orthodontics and which hopefully would start to answer parental queries.

1. Over retention of baby teeth.

52 . 51	61 . 62
82 . 81	71 . 72

2. Crowding of lower anteriors.
3. Buccal or lingual placement of upper laterals.
4. Ectopic eruption of six year molars  
Xray to determine damage to roots of Es.
5. Supernumeraries. U/L.  
Xray of upper anteriors if eruption of 21 & 11 appear abnormal.
6. Missing permanent teeth.
7. Early unilateral loss of deciduous cuspids.
8. Posterior or anterior cross bite.
9. Check of bitewings or if necessary an O.P.G. to determine presence of 2nd permanent bicuspids.
10. Orthodontic consultation always before treatment if patient presents with six year molars which are severely hypoplastic or extensive caries.  
After age nine a further appendix to the initial list could apply.
  1. Check of facial appearance and soft tissues.
  2. Are the face and jaws symmetrical?
  3. Is there lip competence?
  4. Do the upper anterior teeth rest on the lower lip.
  5. Mouth breathing and tongue thrust.

6. Retention of abnormal habits especially thumb and finger sucking.
7. Crowding and rotation of teeth.
8. Digital examination of position of permanent canines.
9. Deviation of centre line.
10. Position of one jaw in relation to the other i.e. overbite, overjet.

Children who fell within these guidelines then have to be assessed by the Supervising Officer. It is at this level that quality of care of the School Service starts to become apparent. A service where Supervisors have no special interest or training in pedodontics is unfortunate. The School Service requires Dentists who are prepared to demonstrate above average knowledge in pedodontics and orthodontics.

The children who by reason of the Therapist's decision now have come to the attention of the Dental Officer would be about the age of 9 or below. They again have to be classified into those where preventive and interceptive orthodontics at non-Specialist level may avert the need for future treatment or preserve the integrity of the dentition.

They require:

- (1) Initial examination.
- (2) Analysis of findings.
- (3) Classification of urgent and non-urgent cases.
- (4) Requiring Specialist attention.

(5) Recall or No further attention.

Older children in the 9-12 years require a similar selection with more emphasis on the need for referral. At this point children whose parents are willing to pay the full cost of private treatment move towards treatment in the private sector. Children who qualify as public patients join Hospital waiting lists which in some cases can mean years.

The remainder receive no treatment either from parental unwillingness or incapacity to pay.

In Britain, the Committee on Child Health Services (22) carried out a study to see if orthodontic screening of nine year olds was cost effective. This report estimated that at least 50% of children had some degree of overcrowding. The screening especially sought out conditions which would respond to interceptive measures and preventive measures which would reduce or obviate the need for future treatment. The Report in its conclusion stated that the way for the future must surely be increased post graduate education to facilitate more informed orthodontic judgement by Community Dental Officers.

Tulley (23) talks of the English School Service and that Consultants under the Health Service provide an experienced advisory service though the demand exceeds the supply of expertise. He reiterates the importance of a back-up service to continue cases which require additional treatment.

The Burlington Study (24) was researched by the University of Toronto Dental Faculty into preventive and interceptive orthodontics and its evaluation. Staff of Pedodontists and Orthodontists met as a committee and decided upon diagnosis, treatment and supervision.

Treatment was divided into three categories:

- (1) Interceptive
- (2) Interceptive and compound treatment.
- (3) Compound treatment only.

Category A.

Interceptive only.

- (a) Habit consultation.
- (b) Consultation re operative work.
- (c) Supernumerary removal.
- (d) Occlusal equilibrium.
- (e) Slicing of mesial deciduous cuspid surfaces.
- (g) Insertion of fixed and removable space appliances maintainers.
- (h) Labial shield.
- (i) Frenectomy.
- (j) Swallowing exercises.
- (k) Extraction of deciduous and permanent teeth as part of serial extraction.
- (l) Over retention of deciduous teeth and pathology.

Category B.Interceptive and compound treatment.

- (a) All forms of interceptive treatment as well as bite planes.
- (b) Expansion plates.
- (c) Monoblocs.
- (d) Labial or lingual arch wires.
- (e) Cervical headgear.
- (f) Partial bands.
- (g) Full bands upper and lower.

Category C.Complex forms of treatment without any interceptive procedures.

The Burlington Study grouped patients into four periods: 3-6 years, 6-9 years, 9-12 years and 12-16 years. The two middle sections would correspond well to School Dental Service screening. This study showed that most interceptive work was done on class I extraction and non extraction cases, 89.5%, indicating that class II and class III children would probably fall into older screening groups.

In 1971 at the University of Pennsylvania School of Dental Medicine (25) a clinic was set up to evaluate the need, demand and efficacy of preventive and interceptive orthodontics. The service was widely advertised as a demand service for parents to bring their children (non referring). This screen by parents

only showed that few were aware of malocclusions in the primary dentition, 2.9%.

In the mixed dentition they were hoping the problem would go away, 32%. In the permanent dentition they recognised the need, 66%. The interesting fact was that the parents who attended showed a considerable accuracy in forecasting malocclusion in the transitional dentitions.

In the Danish Child Dental Health Service (26) systematic screening of children in specific age groups are carried out to ensure uniformity in selection of patients for orthodontic treatment.

At the age of 9-10 years children are assessed as to the need for orthodontic observation, prophylactic measures or therapy. In the particular study quoted the Orthodontist assessed the children with the Pedodontists in attendance. The Pedodontist would later follow the instructions with the Orthodontist as a consultant. Out of 2,301 children, 30% were graded as having no anomalies and 70% as having a malocclusion. Of this 70%, 5% were classified as needing no treatment, 29% had possible need for treatment, 37% were regarded as having a malocclusion needing treatment.

In a screen of 7 year old Finnish children (27) the need for orthodontic treatment was assessed using a treatment scale for that group.

42%                      required no treatment

23.5% were in immediate need of treatment  
34.5% It was considered unnecessary to follow  
occlusal development.

### CONCLUSION

Screening for orthodontics in the School Service is a reality which has to be faced. If there is use of Dental Auxiliaries they must have clear written guidelines as to what anomalies they must look for. The Supervising Officers will make more reliable assessments the greater their knowledge of orthodontics. Screening could show up children who will benefit from preventive and interceptive orthodontics. There could be Specialists available to supply a consultative and supportive backup to Dentists who have screening responsibilities.

**PRINCIPLES OF  
PREVENTIVE DENTISTRY**

## PRINCIPLES OF PREVENTIVE DENTISTRY

This can be related to levels of preventive care. Mouths where these levels have been maintained will only be subjected to malocclusions which would occur by reason of genetic and in some instances environmental factors.

### PRIMARY LEVEL PREVENTION (80)

Individual and community activities of self-help.

- (1) Oral Health promotion, including oral hygiene instruction and information on diet control and nutritional balance for health and growth maintenance.
- (2) Specific protection.
  - Fluoride toothpaste.
  - Fluoridation of water supplies.
  - Fluoride mouth rinsing.
  - Control of intake of refined carbohydrates.
  - Use of mouth guards, helmets for bike riders, car seat belts.

The above implementation of primary level prevention has an enormous effect on how sound the average person's teeth will be and how well they will be looked after in the future. This means that we are now providing esthetically and functionally a good basis for a lasting product. This represents a change of attitude in Australia where up to 1968 the general

public considered teeth to be of a transitory nature. (28)

Fluoridation has reduced the amount of money which had to be spent either by Government or family to control dental caries. The parents of children now have motivation to improve the appearance and function of their children's teeth and realize that improvement is of lifetime value.

This primary prevention is essential to orthodontics because it makes treatment worthwhile. The other important factor is that the primary dentition also has an excellent chance of remaining intact and this enables succedaneous teeth to erupt in the normal pattern of development. Premature deciduous extractions can cause changes in sagittal occlusal relations, deepening of the bite, midline displacement or crossbite. (29)

Protection devices which reduce trauma especially to anterior teeth in young children fall within the wider view of Preventive Orthodontics. Loss of permanent teeth cases are difficult to manage in children, especially if still in the mixed dentition. Even earlier trauma to the primary dentition can leave orthodontic problems in the shape of misplaced or illformed successors.

**SECONDARY LEVEL PREVENTION (80)**

Non invasive or minimally invasive help by trained Dental Personnel often dental auxiliaries:

- Regular detailed oral examination.
- Pit and fissure sealants.
- Calculus removal.
- Non traumatic conservation methods for perserving primary teeth i.e. Silver Fluoride and Glass Ionomer cements.

**TERTIARY LEVEL PREVENTION (80)**

Invasive procedures:

- Removal of diseased tissue.
- Replacement of same.
- Orthodontic correction of major occlusal problems.
- Oral rehabilitation.

If these three levels of preventive care are carried out it means that only orthodontic situations of an unavoidable nature remain to be observed and perhaps treated. The word "preventive" can mean "undertaken in order to forestall or ward off". This comes from "Websters Dictionary". In this sense the three levels of preventive care do fall within basic prevenntive orthodontics.

Jennings (30) states that "all dentists need to be totally aware of the normal growth pattern for a child and to concentrate efforts upon not permitting any

interfering force or forces to produce a deviation from this pattern". He reiterates the damage that can be done by loss of deciduous teeth or badly constructed restorations.

Ackerman and Proffit (31)(32) say that from a clinical point of view local extrinsic factors are the most relevant to preventive and interceptive orthodontics, but their interaction with intrinsic influences must be kept in mind.

#### **AN UNDERSTANDING OF PREVENTIVE ORTHODONTICS**

In the School Dental Service as a publicly funded body the Orthodontic Services will always have difficulty in meeting the demands made upon it. It is essential that patient/parent demand be analysed and rationalised against the possibilities of treatment that can be offered. To do this it might be wise to use guidelines to select and treat children who may be suitable for preventive and interceptive orthodontics.

The six Es enumerated below provide this:

- (1) Economics
- (2) Equity
- (3) Ethics
- (4) Efficiency
- (5) Efficacy
- (6) Esthetics.

(1) Economics

The money available for public orthodontic services and in turn for preventive and interceptive orthodontics in the School Service comes from Government funding for dentistry. This funding is distributed in varying ways. In the past a large amount went towards treating caries and making dentures. The fluoridation of 84% of N.S.W. children's teeth meant that the School Service altered from treatments like extractions and large restorations to a preventive dental service. Today's children have healthy intact dentitions and will probably be like that most of their lives. These children would benefit if problems of function and aesthetics were treated that might worry them. (30)

(2) Equity

Reflection on equity seems to mean with what degree of fairness does a public orthodontic service operate.

A major question would be whether all public patients enjoy similar access to a specialist service, i.e. whether country patients can get to and afford in terms of time and money orthodontic services which by their specialist nature cannot be available at a local level. Whether there is an equitable distribution of orthodontic services in different areas of big cities like Sydney. Fast growing urban areas where the young

people are concentrated may find specialist services have not moved towards them. The far western areas of Sydney are more likely to contain the low income, pension families. It is important that measures are taken in a planned service that equity of access be an accepted principle. The country circuit of the State Orthodontic Service would be a practical illustration of this principle.

Equity also encompasses the very difficult question of who should be treated in the first place. If there is no hope of treating all who might need or desire treatment a system has to be thought through where logic and fairness are deciding factors in who will receive treatment.

Most Government orthodontic schemes try to work out a classification system which grades the severity of orthodontic problems.

- (1) Skeletal imbalances
- (2) Deformities from incorrect development
- (3) Dental.

It is a difficult task as other factors like psychological ones enter into assessment.

In some Government clinics the types of treatment can vary round the Dentist rather than the public need.

Equity in the delivery of a service may be hard to implement and it also should be a planned factor in a State service rather than a number of decisions made at local level without reference to the whole community.

Equity in dental services parallels in equity in medical and hospital services but this does not mean that equity as a goal should not be strived for.

(3) Ethics

The ethics of a public orthodontic service means making the right and proper decisions for that service and the people who are treated by it. It must not be forgotten that orthodontics is about the treatment of people, good decisions will insure that benefit, not harm, comes to them. Each person is an individual and should be treated to their best advantage.

Ethics also enters into the decision like economics as to whether money should be spent in the first place on specialist services. In poor and developing countries, grass roots services may well be more indicated and encouragement of simple preventive and interceptive orthodontics. This may be better for the overall good rather than a highly developed speciality that only a few will benefit from,

The ethical question is always: Is it in the best interest of the patient? This has to be balanced against the resources in manpower and equipment to deliver the service.

Ethically the patient has the right to fully understand his problem and to see what treatments might be available. The patient should understand problems such as time involved, length of treatment and discomfort.

(4) Efficiency

Efficiency in the delivery of orthodontic services, even of the less sophisticated interceptive orthodontics, is directly related to the training of the Dental Officers in the school system. Time and equipment can be wasted if the quality of training in orthodontics is low.

Certain factors can be built into a service which can help efficiency, peer review, patient feedback, good planning of space and equipment, an available system of consultants and updating of knowledge by both courses and texts, papers and journals. (31) Many health professionals are often trained to be good at their clinical work but not in how to guide an efficient service.

(5) Efficacy

An understanding of preventive orthodontics is about results. It is about the benefit the patient derived from his treatment. This would be from both a professional and patient point of view.

Questions to ask are:

Did it work completely or was it a compromise?  
i.e. satisfactory but not perfect. Will the treatment be of a satisfactory long lasting nature or will it be unstable? Was the patient a satisfied patient at the end of treatment because the problem as he perceived was fixed?

Did the treatment offer the best solution for the problem in terms of time and money for the recipient?

Did the patient feel that what was achieved for him in results was worth the time, travelling, pain and discomfort he experienced? Did it have a positive effect on his self esteem? (35)

(6) Esthetics

This is a most important point as it touches the fundamental aspect of how a person perceives and feels about themselves. It is not vanity to want to look like normal, ordinary looking people. To be able to go to school without suffering ridicule, to attract other people to you and to obtain work without discrimination. (36) There are many adults who have suffered all these things because of their appearance and who intensely desire that their children should not be subjected to the indignities they endured. There have been studies that show that children with deformed mouths are often discriminated against from quite early in life. Quite often severe crowding can cause distress though it usually ranked low in necessity for treatment. To the number of people who live below the poverty line, poor physical appearance is yet another handicap which will keep them locked into that level of society. (37)

**ANALYSIS FOR  
PREVENTIVE ORTHODONTICS**

### ANALYSIS FOR PREVENTIVE ORTHODONTICS

Preventive orthodontics could be defined as any action taken to preserve normal growth in the dentition of a child. It is the preservation of the integrity of the primary and permanent normal occlusion during development. (38)

To preserve both the dentitions it is essential to have a thorough understanding of what constitutes normality at specific times. It is an art to be able to watch the developing dentitions with an educated and understanding eye.

The children attending the School Clinics are already in the full primary dentition. They age from four years and upwards. Their tooth size and mineral mass are predetermined by inheritance. It is uncommon but not impossible that deciduous teeth be missing and anomalies in crown formation are not as common in deciduous teeth as in the permanent teeth, though the occasional twinned tooth can be seen. (39)

The deciduous teeth, in particular the molars, can have their eruption impeded if the teeth or tooth becomes ankylosed to the alveolar process. This is also possible with the permanent teeth but not as likely. The teeth appear to have submerged but in actual fact they have become locked or fused at a particular level while the rest of the adjacent teeth gain their normal vertical height. If this occurs

bilaterally the posterior bite appears to be open. It is important to establish whether deciduous molars have been taken out as the six year molar distal to an ankylosed second deciduous molar may tilt forward. This situation may provide a pathway for bacteria from the gingival tissue down to the crypt of the unerupted deciduous tooth. An O.P.G. will often show the molar, the deciduous second, lying very close to the border of the young mandible. If infection is present and the deciduous molar has to be removed a wise course may be to have it done by an oral surgeon.

The primary arches are mostly ovoid and less variable in conformation than the secondary arches. If there is interdental spacing between the incisors prior to their loss this would indicate that there would be sufficient space for the permanent teeth. No spacing or even primary incisal crowding could indicate future crowding. (40)

The occlusion of the deciduous posterior teeth is important to observe as they are an indication of the future relationship of the permanent dentition.

There are two types of primary occlusion which are the precursors of a class I in the permanent dentition.

- (1) The six year molars and second deciduous molars are in a class I relationship.
- (2) The molars are in a flush terminal plane but the lower six year molars will slide forward into a class I when the second deciduous molars are

exfoliated.

Children whose six year molars are in a flush terminal plane relationship may develop a mesial step if the deciduous dentition is affected adversely by caries, oral and finger habits or skeletal disharmony i.e. mandibular hypertrophy. In places where there is a rough diet giving occlusal and interproximal wear the mandible which is already growing faster than the maxilla can move in to a more forward position and thus the six year molars can slip into a class I relationship on eruption. Children with a soft diet and no occlusal and interproximal wear may remain with the six year molars in a flush terminal plane relationship. (41)

As the child passes from the deciduous dentition to the mixed and then finally the permanent the clinician again needs to have thorough understanding of the norm to maintain a proper preventive attitude. For instance there is a dramatic difference in space loss for premature exfoliation of deciduous molars compared to non-mutilated control groups. (42)

#### **CALCIFICATION**

The second dentition shows certain variables. There is a sex difference with girls more advanced in calcification of permanent teeth at every stage with this increasing at the later stages. Calcification rates are different for racial groups and also

socio-economic and nutritional differences can be a factor. (43)

### ERUPTION

Permanent teeth do not start to erupt until after the calcification of the crown. (44) When about two thirds of the root is formed the tooth erupting through the alveolar bone and through the gingiva when approximately three quarters of the root is formed. On average after calcification of the crown the posterior teeth may take from two to five years to reach the alveolar crest and from twelve to twenty months to come into full occlusion. Once occlusion has occurred the root completes formation within a few months.

The timing and sequence of tooth eruption seems to be mostly gene determined with racial patterns present. (45) Nutritional factors have to be severe to disturb eruption and calcification as endocrine dysfunction affects the skeleton far earlier than the teeth.

Pathological conditions such as abscesses and pulpotomies can cause teeth to erupt earlier. Extraction of a deciduous tooth will cause the permanent tooth to erupt earlier if that tooth has already begun the first stages of movement. If not then the permanent tooth may be slowed down due to reformation of the alveolar bone. (46)

The time of eruption of teeth tends to be a family characteristic with children who teethe early or late

getting their second teeth in the same pattern. Girls tend to have eruption of their teeth on average 5 months earlier than boys.

#### SEQUENCE OF ERUPTION

The most favourable pattern of eruption is also the most common. (47)

In the maxilla           6-1-2-4-5-3-7

In the mandible         6-1-2-3-4-5-7

The lower laterals erupt about the time of the upper centrals. The lower canines about the time of the upper fours. The upper canines are erupting about the time the lower second premolars are coming into the lower arch.

{Illustration from Moyers (48)  
Normal order of eruption Fig.V1.10}

Problems can arise if the second molars erupt before the canines or premolars further shortening available arch length.

Teeth may erupt ectopically or out of normal position. The most common teeth being the cuspid and maxillary first molar, 3% of children will have the maxillary first molars in ectopic eruption. (49) It is associated with:

- (1) large primary and permanent teeth
- (2) shorter than average maxillary length
- (3) posterior positioning of the maxilla

- (4) atypical angle of eruption of the molar
- (5) possible non-formation of upper left second bicuspid.

**AN UNDERSTANDING OF INFLUENCES ON THE TEETH AS THEY PASS THROUGH VARIOUS STAGES OF THE PROCESS OF ERUPTION**

The process of eruption could be divided into four stages:

The first stage would be as the germ of the tooth lies in the bone prior to movement. Its position would be determined by that person's genetic inheritance.

The second stage occurs as the tooth moves into the alveolar bone prior to eruption. At this stage the tooth can be affected by nearby processes, the absence of teeth, the effect of caries and restorative procedures on primary teeth which may affect the rate of root resorption on early loss of primary teeth. This may either hasten the intra alveolar eruption if the tooth is already a fair way through or slow it down by the laying down of more dense bone making it harder to grow through this. An example of this type of influence is the study showing that early loss of the maxillary 1st molar in 11 cases resulted in nine cases having malalignment of the maxillary cuspid, blocked out to the labial. Of the remaining two cases, one was of microdontia and the other a partially impacted canine. (50)

The third stage of eruptive process occurs as the tooth moves into the oral cavity. It is now subject to

the muscles of the lip cheek and tongue and to any habits a child may develop such as finger and thumb sucking and tongue thrust. The teeth may all drift if adjacent teeth have been lost. Literature shows that with regard to age at extraction and time for closure, all the experiments demonstrate conclusively that the longer the extraction space is present, the greater the space closure will be. (51)

The fourth stage of the tooth's passage is as it moves into occlusion. Once there it is subject to all the forces of occlusion. The upward eruptive force meets the opposing force of occlusion which is apically directed and which is dissipated by the periodontal membrane through to the supporting alveolar bone. The masticatory muscles exert force through the interdigitation of cusps.

#### THE DIRECTION OF FORCES OF OCCLUSION

The posterior teeth through their axial inclination exert a mesial force at their points of contact which is an anterior component of force. This is countered by the approximal contacts of the teeth lip and cheek muscles. (52)

The mesial drift of teeth is inherent. (53)

An understanding of the mesial drift of teeth helps to make decisions in preventive orthodontics. Friel (1945 & 1954) compared cephalographs against Bolton plane and explained that teeth could only move

forward. He showed that the distal migration seen in certain teeth was a function of an applied muscular force. (54)

It shows the likelihood of forward migration of permanent first molars if the integrity of the primary dentition is not maintained. Lundström found that the effect of space loss might be dependent on the time the extraction was performed i.e. more crowding in the 7-8 years than at 9-10 years. (55) This in turn would indicate the desirability of holding space for the permanent dentition in some cases.

#### SIZE OF TEETH

Tooth and bone size are under separate genetic control mechanisms so this can lead to either considerable spacing or crowding problems in some children. There may also be a tooth size discrepancy between upper and lower arches. This could mean perhaps one or two or a whole group of teeth could be larger or smaller than their mandibular counterparts. The Bolton tooth ratio analysis can show whether the overbite and overjet relationships will be somewhere near the ideal. (56) In younger children where preventive orthodontics might be considered a mixed dentition analysis would be helpful. This gives some idea of the predicted size of the unerupted canines and premolars and how much space is left for molar adjustment. It gives an idea of the space requirements

of a particular child and would be a guide to possible mixed dentition treatment. (57)

#### **VARIATION IN THE NUMBER OF TEETH**

The most frequently missing teeth are, excluding third molars, the mandibular second bicuspid, maxillary lateral incisors and maxillary second bicuspid. These account for 85% of missing teeth. The third molars are missing in about 16% of whites. Females are more likely to have missing teeth and children with missing bicuspid or laterals are quite likely to have third molars missing also. Missing teeth tends to run in families. If any interceptive or preventive orthodontics is being considered the possibility of missing teeth must be taken into account i.e. sometimes the ectopic eruption of upper first permanent molars may be an indication of missing second bicuspid. (58)

#### **SUPERNUMERARY TEETH**

These most often occur in the pre-maxillary region near the midline. They can be formed from epithelial remnants but also be a family tendency. They can range from one or two present to a number. In the mixed dentition displacement of the upper incisors can often be accounted for when the radiograph shows a supernumerary. In some cases an upper central incisor will be quite displaced and even if the supernumerary

is removed the child might need a simple removable with light springs to reposition it.

There are differing types of supernumeraries.

(1) Conical crowns, most often in the midline, they can be single, in pairs or in clusters.

(2) Teeth of normal size which are supplementary.

Some children will have supplementary laterals.

If they are on one side only they can cause a midline shift or if on both side cause an overjet.

Extraction of the supplementaries falls within interceptive orthodontics allowing the arch to resume a more normal shape as early as possible.

Muscle forms will often be all that is needed to align the other teeth. (59)

(3) Teeth of atypical form and shape. Sometimes there can be some interceptive work to try and reduce over large teeth mesiodistally or grind over-large lingual cusps behind upper centrals to lessen occlusal interference.

#### **WIDTH OF ARCHES**

It is important that Dentists who may wish to practice Interceptive and Preventive Orthodontics understand how the arches develop and grow especially if they are making judgement regarding space available. Graber states that there is relatively little change in width dimensions in the deciduous dentition from two and half years till the eruption of the permanent

successors. (60) Basically there is very little increase in intercanine width, approximately 1.12mm measured at the gingival level between years five to eighteen.

In the maxillary and mandibular premolar area there is a mean increase of 2mm but some of this could be from the fact that the bicuspids are narrower than the primary molars.

In the maxilla there is an increase of width around the premolars and the canines as the alveolar processes grow downwards and more buccally with the erupting teeth. Thus the period of greatest growth is at this time.

In the molar region the maxillary arch width increases significantly more than in the mandible. The lower six year molars move forward to take up the remaining leeway space, thus moving into the narrower part of the arch.

Space gain by widening the arch is almost impossible in the mandible as is distal moving of the molars to increase the perimeter. The dental arch perimeter reduces throughout the transition from deciduous to permanent dentition. In the maxilla there is the natural divergence of the palatal walls plus the possibility of widening the palatal suture line.

At this time alternative systems such as arch expansion system are popular. Children may wear upper and lower arch expansion plates which may achieve very little for

them even after months of wear and they may still have further orthodontic problems later on. It illustrates again the interceptive orthodontic action should be thoroughly thought through as to whether it is appropriate, or of long term benefit and not duplicate later treatment which may become necessary. The essence of interceptive orthodontics is that it must have clearly defined and achievable goals which will obviate the need for further treatment or make further necessary treatment quicker or easier.

#### **AN UNDERSTANDING OF OVERBITE AND OVERJET**

During the primary, mixed dentition and permanent dentition there are changes in the dimensions of overbite and overjet and it is important to distinguish normal from abnormal changes so that no unnecessary interceptive orthodontics is attempted.

##### Primary Dentition Period

During the primary dentition the overbite decreases and the overjet can be reduced to nothing. As the primary teeth have softer enamel occlusal wear can result in an almost edge to edge bite. ((61)

##### Mixed Dentition Period

In the early stages of the mixed dentition from about nine to twelve years the overbite increases and then it decreases, these changes are caused by the

exfoliation of deciduous molars and then the eruption of permanent teeth and an increase in vertical growth.

(62) Overbite interacts with a number of vertical facial dimensions including height of the ramus.

Overjet is correlated to the antero-posterior relationships of the maxillary and mandibular denture bases. (63)

During the mixed dentition period there are two important changes which will begin to result in normal or abnormal development.

Firstly the way the erupting teeth use the perimeter space of the arch.

Secondly the way the teeth adapt as they move into occlusion. (64)

#### **DENTAL ARCH PERIMETER AND ITS UTILISATION**

The lack of understanding of this factor causes wrong diagnosis and clinical failures when interceptive treatment is attempted in the mixed dentition without proper thought especially in the mandible. ;

The arch perimeter is used in three ways in the mandible:

- (1) The incisors are usually crowded and need space to realign. Parents may often be very upset when they see the above occur and quite often press for the removal of the deciduous cuspids to correct the crowding.

- (2) The canines and bicuspid need sufficient arch perimeter to erupt into and be fitted in between existing permanent teeth.
- (3) The molars if not already in class I move from a flush terminal plane into class I.

#### LOWER INCISORS

These align by using the arch perimeter in three ways:

- (a) Slight anterior dental arch width increase.
- (b) Utilisation of any interdental spacing between the primary teeth. (65)
- (c) The primary canines move distally. Even with this distal movement the lower anterior crowding does not resolve until the deciduous canines are lost. This realignment uses some of the posterior space available for the canines and bicuspid. Use of a mixed dentition analysis helps to determine how much room will be needed for the canines and bicuspid and whether the lower incisors may have sufficient room to unravel. (66)

After the eruption of the canines and bicuspid there should still be some posterior leeway space available for the molars to move into a class I.

During the mixed dentition the mandibular arch perimeter shortens.

There has been controversy regarding whether the closure of the leeway space comes only from the

posterior teeth (67) or whether the primate space is closed from the anterior by the forcing of the primary cuspid distally by the lower lateral incisor. (68)

In the maxilla these eruptive adjustments are not as critical as the incisors can incline and it is also easier to move the molars distally.

#### THE OCCLUSAL CHANGES IN THE MIXED DENTITION

A study of the position of the upper and lower second deciduous molars will indicate a developing class I, class II or class III.

{Illustration from Moyer (69)  
Transitional adjustment mechanisms during the mixed dentition.}

This illustration shows that the flush terminal plane of the primary dentition can result in differing molar positions.

- (1) A child with a flush terminal plane, a mild skeletal class II and lack of arch perimeter would finish as a class II because of lack of room for the lower molars to move forward.
- (2) A child with a flush terminal plane, a class I skeletal pattern but with no leeway space could end up with an end to end molar relationship.

In the diagnosis of the possible molar relationship that will eventuate the factors that have to be taken into consideration are the expected amount of forward growth of the maxilla and the mandible and

the adjustment of the leeway space of both maxillary and the mandibular dental arches. The skeletal or forward growth is of critical importance. The amount of space available for the teeth can be predicted fairly accurately but the amount of skeletal growth is another matter. It has been attempted to predict for nine year olds, their anterior skeletal profile at twelve. Hiles found it was not possible to predict the molar mandibular relationship or the increment of growth that could be expected. (22)

It is also important to try to anticipate or predict directions of growth and the amount in relation to dimensions of time and space.

Some indications for this would be:

- forward versus downward growth
- time of growth acceleration in adolescence.

## **CONCLUSION**

This discussion is to try and give a basis of what could be regarded as reasonably normal expectations of the developing dentitions that Dentists could apply when supervising large numbers of children.

Interceptive or Preventive Orthodontics measures that might be instituted should only be undertaken against a thorough understanding of what is possible to achieve, short and long term and whether the necessity for treatment is really there.

**DISCUSSION**  
**OF POSSIBLE**  
**TREATMENTS**

## DISCUSSION OF POSSIBLE TREATMENTS

Discussion of the types of preventive and interceptive orthodontics which could be practised within the State Orthodontic Service by School Dental Officers. This would require expansion and financing beyond its present level.

The benefits that could be derived from utilisation of the Dental Officers:

- (1) Minor tooth movement could be done at a lower skill level reducing the demand on State funded orthodontic clinics.
- (2) It could mean that more children would receive treatment who cannot expect alleviation of their less severe problems under the present constraints of Public Health spending.
- (3) Dentists who work within the restricted field of children's dentistry could benefit from the challenge of this type of work.

The problems could be to insure:

- (1) Dentists should receive adequate and ongoing training including regular access to a Consultant.
- (2) To have overall control of such system to make certain treatments were following proper directions and were cost-effective; also utilisation in a rational manner of manpower and materials.

Two points are made by Gottfried Schmuth,  
University of Bonn, Germany, G.D.R. (70)

- (1) Orthodontic care often requires a multi phased approach. It is no longer justifiable to start orthodontic treatment only after complete eruption of the permanent dentition when we know that early intervention may prevent a more serious malocclusion.
- (2) That removable appliances may be used in a variety of different types of problems to obtain reasonable results without having to resort to fixed appliances. Presumably this would also refer to functional appliances. They can be used in the modern orthodontic office as primary treatment approaches as well as adjuncts to other forms of therapy.

He illustrates several cases within the scope of a Pedodontist i.e.

A class II dental malocclusion in the mixed dentition. The child had a deep anterior bite, an excessive overjet with a lip habit which was separating the two upper centrals. An activator was used to encourage vertical dento alveolar development, to convert the class II and align the anteriors. The case took 20 months and needed a second functional appliance for retention.

Schmuth states: "In our hands, treatment of class II Div 1 malocclusion begins as soon as the four permanent incisors are present, as we wish to reduce the chance of damage to any protruding teeth. In cases of mandibular underdevelopment our clinic utilises a functional interceptor appliance to halt the progression of maldevelopment and re-establish a normal perioral muscle development". From this can be seen that interceptive and corrective orthodontics mixed dentition orthodontics is alive and well in Europe.

#### **HABIT THERAPY**

Habit Therapy in early mixed dentition is within the scope of interceptive orthodontics. Appliances can be made with shields to remove tongue interference.

(71) They can provide a more normal muscle environment during eruption and development. Prolonged thumb sucking is often stopped quite quickly with the use of plate which can both be used to retract the upper incisors and to nullify the pleasure gained by sucking.

Proffit (72) lists non skeletal problems in pre adolescent children which would make a reasonable guide for possible treatments for School Dental Officers. With treatment for potential alignment problems it has to be borne in mind that an important problem about the "shopping list" below is that it is implying dealing with each problem in isolation by a recipe approach. However in too many malocclusions, problems develop

different combinations of these, which then greatly complicates the recipe solution.

- (1) Space maintenance for missing primary teeth.
- (2) Space regaining.
- (3) Ectopic eruption.
- (4) Missing permanent teeth.
- (5) Supernumerary teeth.
- (6) Midline diastema.
- (7) Midline discrepancy from interarch asymmetry.
- (8) Crowding in the mixed dentition.
- (9) Mild crowding, adequate space predicted for the succedaneous teeth.
- (10) Posterior crossbites.
- (11) Incisor anterior/protrusion.
- (12) Anterior crossbites.
- (13) Maxillary dental protrusion

Vertical problems

Habits and open bites

Deep bite

Ankylosed primary teeth.

Joseph Sim (73) in his book "Minor Tooth Movement for Children" states that in the specialty training of Pedodontists which in this case would be School Dental Officers there is a need for a broad background in the diagnosis and treatment of minor malocclusions with special weight being given to preventive and interceptive measures, minor corrections also being

studied and practised. He considers interceptive orthodontics should be limited to "mild malocclusion".

Adams (74) recommends basing initial preventive and interceptive orthodontics on eight reasonably uncomplicated appliances and then perhaps increasing scope of treatments. His different appliances are only likely to be useful for single problems, not combinations of problems from the list of the 13 above. The cost of removable appliances may be difficult to justify.

He lists them in order of difficulty of use and fabrication.

- (1) Removable and fixed space maintainers including fixed, soldered lingual arches.
- (2) Acrylic inclined planes (fixed) and oral screens (removable).
- (3) Upper and lower Hawley appliances including distalizing devices for six year molars i.e. helical loop springs, split saddle acrylic springs and slingshot springs (all removable).
- (4) Palatal expansion devices (removable and fixed removable).
- (5) Fixed - removable lingual arches with horizontal or vertical lingual sheaths (fixed).
- (6) Heavy round wire labial arches (fixed)
- (7) Light round labial arches (fixed).
- (8) Extra oral force appliances (combining fixed and removable elements i.e. cervical anchorages).

Reading the literature it becomes apparent that in the United States the feeling among Orthodontists is that minor tooth movements in the mixed dentition could be within the scope of children's and family Dentists but craniofacial problems in the permanent teeth should be reserved for treatment by those who have had adequate theoretical and clinical experience in the physiologic and biomechanical factors involved.

(75)(76)

In Europe especially, children are often treated in Government funded clinics with functional appliance therapy. These are typically class II patients and the object is to increase dental arch dimensions, to alter vertical relationships and to close or open the mandibular plane. Nearly always the idea is to stimulate an increase in the growth of the mandible. The question of whether this is possible is still controversial. In an article by J. McNamara (77) he states that the research done at Ann Arbor. and in Strasbourg by Petrovic (78) indicate that an overall increase in mandibular length is achievable only during active growth period.

Petrovic states that in a relatively high percentage of patients the functional appliances do not fully correct interjaw relationship. If School Dental Officers start to use these functional appliances they move from treating class I minor malocclusions to the more complicated craniofacial discrepancies. They are

of course treating mixed dentition cases where active growth is occurring. In Europe in countries where socialised dentistry is available a greater number of children can be offered "some" treatment with this type of approach. How effective it is has to be evaluated against Petrovic's statement that a relatively high proportion of class IIs are only partially helped.

Functional appliances such as Frankel's (79) could be used in the School Clinics as part of an interceptive orthodontic programme with the proviso that the cases were carefully chosen which in turn presupposes diagnostic skills of the Dentist and also that well made appliances could be available which is not always easy to obtain. The true cost of these sorts of treatments and their effectiveness is another matter. Frankel himself only uses these appliances in about 15% of cases.

**CONCLUSION**

### CONCLUSION

Preventive and Interceptive Orthodontics is a controversial question. It appeals to the Pedodontist as an extension of children's dental care. Now that caries is no longer a major problem minor tooth movement is an attractive option. This can be seen by the success of systems promoted for application by G.P.'s where much of the technical work is done by laboratories.

The importance of an informed diagnosis is illustrated before commencement of Preventive and Interceptive Orthodontics. It is necessary to estimate whether the considered measures would be sufficient or whether the patient still faces major treatment which would incorporate these earlier measures in the later procedures. A two phase, two person treatment is time wasting, costly for parents and risking fatigue and burn out for the child before the major phase of treatment commences.

Preventive and Interceptive Orthodontics should be limited to the measures necessary to preserve the dentitions intact. These measures should be self limiting, a complete course of treatment where no further treatment is envisaged in the permanent dentition or where it would be of such a nature that it would considerably shorten future treatment.

In the School Dental Services certain types of

preventive and interceptive orthodontic treatments could be offered within the above guidelines. Some of this treatment might be of a nature where a reasonable results might be obtained, though perhaps not perfect. Sometimes complex treatments may not be available for reasons such as geographical, handicapped children or where long waiting lists prevail. Like many subjects, the more study that is put into orthodontics the more the Dentist realises the complexities involved.

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