

ORTHODONTIC EDUCATION*

E. STOREY, Ph.D., D.D.Sc.†

INTRODUCTION

The title I have chosen for my subject to-day is Orthodontic Education; but for whom, and for what? Is this education for the sake of orthodontists, or for the sake of the community? Is present orthodontic education satisfactory or not? Can orthodontic education be disassociated from the general problem of dental education and the role of orthodontists and orthodontics in this process? I do not believe that it should be discussed in vacuo, for it is but part of a general problem. Consequently I will try and answer the wider questions posed by the title of the paper and not restrict myself to problems which so many orthodontists have tried and so many have failed to answer.

The impression gained from orthodontic writings is that orthodontists have stood outside the general dental education system for too long, and while pressing vigorously for time in the curriculum for the subject of orthodontics, have appeared highly critical of their colleagues, the real purposes of University education, and the real needs of the community. Indeed they have earned the title of the prima donnas of dentistry. Perhaps they are, for in the past orthodontics was regarded as an art and hence it is not surprising that it attracted artists of quite outstanding temperament. Unfortunately not many have tried to understand the nature of the educational system and have been rejected or ignored by it, and unfortunately a most important basic dental science vital to the future development of dentistry has been neglected. As a result the dental service given to communities has been far less than it could have been. Already dentists are in short supply and communities are turning to other means for satisfying their dental needs. Time is already running out and a race is developing between conflicting ways of solving the dental problem.

Three factors will influence the future development of dentistry. First, the shortage of dentists to treat the existing dental problem; secondly, the exploding birth rate, and thirdly, dental research results. In this situation, although research workers are pathetically few in number, I believe that their efforts are the only means by which an adequate dental service can be brought to the community before the community, in desperation, turns to untrained

personnel, not under dental control, to supply its dental needs. However, the efforts of dental research workers will be of no avail unless their findings are applied as quickly as possible in clinical fields. To do this requires that teaching and research go hand in hand. Consequently, in this first paper I will consider general dental education with particular reference to orthodontics, and in the second paper orthodontic research.

THE PRESENT DENTAL STRUCTURE.

In all Schools the dental curriculum is overloaded with technical and clinical subjects to such an extent that University education as such is impossible. The system was devised many years ago and it is only recently that consideration is being given to adapting it to the requirements of the second half of the Twentieth Century. Many authors have criticized the present educational system, for after all there is so much to criticize, but few have made any concrete propositions as to how it can be satisfactorily altered.

There are essentially two ways to change teaching structures: evolution and revolution. I adhere to the fundamental proposition that Universities are composed of scholars who settle their affairs in democratic ways, so that evolution can occur. In the Universities most curricula are decided by a committee, probably a sub-committee of a faculty. Committees vary, a few are effective, but unfortunately most are merely a device by which a large number of people spend an inordinate amount of time devising semantic arguments which will enable them to avoid coming to decisions, and hence will preserve the status quo. If the status quo is preserved for too long, then revolutionary changes occur. Indeed, the best way of making sure that revolution will occur, instead of evolution, is to persistently ignore change. This has been done for too long in dental schools and to-day not only dentists but the community is paying the price.

Let us consider the orthodontist at a curriculum committee meeting. By and large his colleagues on the committee have not got the faintest idea what he is talking about. They

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†Professor of Conservative Dentistry, University of Melbourne, Victoria.

are not interested in arguments about whether an edgewise arch system, or a light force technique should be taught. They all have their own problems, which appear more immediately pressing and urgent than that of orthodontics. The restorative professor deals with occlusion in his own way and by and large sees no reason to move teeth into a better position. After all, if he did this there would be no need for oral rehabilitation. He generally fails to realize that his subject is only a minor branch of orthodontics, where occlusal adjustments are made over a relatively short period of time by an extraordinarily complex set of procedures devised by imaginative dental watch-makers, exquisite in detail, aesthetically delightful and completely useless as a means of solving the overall dental health problem. The professor of prosthetics, still very powerful on committees by virtue of the innate conservatism of dental schools, fully realizing that within a generation or two his subject will be relegated to a minor place in dental practice and teaching, fiercely maintains his empire against all-comers, and has little sympathy for orthodontics. The periodontist regards both the restorative and the prosthetic workers with astonishment. It is difficult for him to comprehend what function they will serve in the future. After all, dental caries will be eliminated in 20 or 30 years' time and the most important subject will become periodontics. In this field an increasing number of people will strive to keep an ever increasing number of sound teeth in an ever deteriorating and ageing dental skeleton. He concedes that orthodontics, as a minor branch of periodontics, is necessary to align teeth. The professor of preventive dentistry considers all other subjects are merely obstacles to be overcome, for his efforts will eliminate the need for dental care by the year 2000. He resents time given to other subjects, for this will delay the golden era of dentistry when academics have put dentists out of business.

The orthodontist, having failed to educate his colleagues, is almost certain to be outvoted on any dental curriculum committee. He may be correct, that the only way to increase the importance of orthodontics in the dental course is to re-organize the rest of the curriculum, not orthodontics. However, this argument is not usually met with much sympathy. One has only to read the comments of Brodie on orthodontic education in the United States to understand the real problem of somebody striving to introduce orthodontics into curricula against the

apathy of those who are not interested in the subject. This is a vicious circle, for once a school has set its mind to the task of maintaining its Nineteenth Century place in the world, it is difficult to break out of the circle. However, the situation is rapidly deteriorating to such an extent that even dental schools are now examining their problems very closely to see what their real needs will be in the future.

Instead of trying to manipulate the limited time in the already over-crowded dental curriculum, let us take a step forward in time and consider the practice of dentistry and orthodontics in the year 2000. After all, this is an extremely small step. The students we teach in First Year in 1969 will be aged 50 in the year, 2000, and at the height of their professional careers. By then dental caries will no longer pose a serious dental health problem, for fluoridation, food additives, dextranases and other enzymes, atomic remodelling of tooth surfaces, and impregnation of teeth with caries-proofing plastics will have been perfected. Dental health education will at last be having some effect and immuno-chemical methods of preventing dental caries will be in the process of being developed. The nature of periodontal disorders will be much more thoroughly understood and coming under control in the younger age group, but will still present a problem in the ageing osteoporotic patient. The real problems of dentistry will now revolve around developmental abnormalities such as hypoplasia, malocclusions and cleft palates. Traumatic injuries and surgical and restorative procedures for ageing patients with attrition and erosion of teeth will present a greatly increasing problem. Prosthetic work for older patients will still be required, but in the younger generation it will be less popular and lost teeth will be replaced with implants or transplants.

The general practitioner of dentistry in the year 2000 works as the head of a dental team. Under his control, or at his disposal, are dental nurses, laboratory technicians and therapists. Therapists are trained for 2 years, the first year a common year while in the second year they specialise in one subject and are trained to perform routine technical procedures under the general supervision of dentists, but only in one of the following fields: children's, orthodontic, periodontics and prosthetic therapy.

In the special field of orthodontics, the therapist takes impressions, X-rays and biological specimens, such as blood and urine, from

patients who first attend for treatment. Then the orthodontist considers cephalometric tracings and models, and using his clinical judgment, performs the most difficult task of all—he decides the treatment plan for the particular case. Consulting the endocrine analysis of urine and blood, he estimates the growth potential of the patient and decides whether treatment should occur now or later, when a growth spurt appears imminent. The orthodontist then designs the general form of the appliance. Models with measurements of the teeth and the desired end result are fed into a computer, and a preformed plastic wire, capable of exerting the required continuous forces, for these are built into its elastic "memory", comes out of the machine. The therapist then attaches preformed bands or brackets with appropriate attachments to teeth. The plastic wire is attached to brackets by the orthodontist who makes the final adjustments.

However, recent developments have influenced the number of younger orthodontists to cement plastic wires directly to teeth. By now the centre of enamel prisms can be selectively removed and appropriate plastic bonding materials with organic chains attached directly to the crystals. The problem of removing plastic brackets and wires has been solved by using ultrasonic frequencies capable of breaking organic bonds. Already the more radical younger orthodontic research workers are talking of dispensing with wire forces entirely. Recent developments in the field of magnetism in 1990 indicated that pinhead-sized metal films are capable of responding to magnetic fields with great precision over reasonable distances. Now it seems that patients with appropriately placed metal films cemented to teeth could have these straightened by wearing headgears which apply the appropriate magnetic flux during the night. That these give promise of being successful is adumbrated by editorials appearing in the ultra-conservative orthodontic journals attacking the development as unphysiological and a threat to the art of orthodontics.

If you accept this picture of orthodontics in the year 2000, let us consider the problem of the student entering the dental course next year, in 1969, who will be at the peak of his professional career in the year 2000. Is the educational system to train him to meet the problems of five years hence, and in so doing make him quite incompetent to adapt and think in a continually changing environment, or alternatively, are we to train him with a basic,

broad understanding of the nature of dentistry and the principle of orthodontics, so that he accepts his role in life and is eager to approach the year 2000, not regarding the future with bitter antagonism and resisting it at all costs as it continually moves beyond his reach. I believe we must train our students for the year 2000 to-day. Above all, we must train the mind and stretch it, for this is the one thing that separates us from our auxiliaries such as nurses, technicians and therapists. The dentists of the future must accept education as a continuing process which lasts throughout life. If this proposition is accepted, then we must devise more acceptable ways of carrying out education throughout life at a professional level with graduation but the first step on the road along which our students will continue for 40 to 50 years.

THE FUTURE DENTAL STRUCTURE.

The Nature of Education.

University educational systems may change, but the fundamental objectives still persist. The most important is the training of minds to think and reason from first principles. Given facility in this, graduates will emerge equipped to deal with a changing environment. Students must participate and must thoroughly understand the real problems of dentistry, and not become obsessed with technology for its own sake. This is becoming extraordinarily clear now, as techniques change year by year and students trained to perform single techniques become hopelessly lost in trying to keep up with a bewildering variety of new fashions.

The Nature of Dentistry.

Dentistry must be regarded as a biological science in its widest sense in which the technology of dental treatment takes second place. Technology is only the means to an end, and while the aim of better dental health remains constant, the means of achieving this will alter continually throughout the years. If this concept is accepted it means that the dental students of the future must have a better understanding of the nature of biology and this will require greater emphasis on subjects such as mathematics, biochemistry, biophysics and bioelectronics, as well as sociology and psychology. With his better understanding of biology the dentist of the future, in treating patients will still require great technical skill and knowledge of materials. He could best be described as a biological engineer and will require a greater understanding of the newly developing science of biomaterials.

The Structure of the Curriculum.

By the year 2000 the first and second years of the dental course will probably not exist as we know them now. We may even have some form of college system such as that in America. When dental students enter the dental course proper, they will be introduced first to the problems of growth at the biological level, and throughout the course this subject will assume major importance. Not growth as described by orthodontists, but a combined subject in which all aspects of development and senescence are combined to give a comprehensive view of the problem of development and ageing. In this the problems of child, adult and senile behaviour will assume much more importance than they have in the past, and consequently the patient will assume the central position in the dental structure. In most schools he has been forgotten, indeed dismembered, and his oral parts scattered to the four winds. It is high time the patient was put together again, indeed remembered. This is the building block on which our new course is designed.

As the patient is remembered, the artificial divisions between subjects such as restorative and prosthetic dentistry, orthodontics and conservative will begin to fade. This will mean reorganisation in the dental schools, so that instead of working on four or five parts of the same oral cavity in different departments, the patient for most purposes will remain "remembered" and the dental structure will revolve around him. This could well mean that at the clinical level most clinical divisions will vanish. This also means that students will be required to work on the whole patient. If this concept is accepted, then orthodontics will naturally fall into place and become an integral part of dental education, not separate as it is now. If this concept is accepted, then the nature of our teaching structures and our hospitals must change.

The Nature of Dental Hospitals.

In clinical years in the future students should work in hospitals whose organisational and administrative structures are different from those we know now. I believe that one of the greatest failings in the dental educational system to-day is the artificial division of hospital and school into watertight compartments. The students of the future should work in teaching hospitals where both teaching and service are complementary facets of the same service, and the artificial financial barriers of to-day have

been eradicated. These barriers are a heritage from the past and are complicated by the Federal/State financing systems for both health and education. This means, in the dental schools, particularly in the clinical fields, educators and students are caught in a squeeze between two bankrupt systems. The sooner this is realised, the sooner it can be remedied.

The student of the future should work for some time after graduation in a dental hospital, or in one of the extramural areas of such hospitals. He should study the dental system into which he is emerging, and work in its various aspects before he decides where he will start his professional life. Above all, he must regard the dental hospital as the centre of dentistry in the State, and working in it the acme of success. Translation from private practice to hospital practice or academic life should become easier in the future, not harder.

If the recent graduate, after spending a year or so in a hospital, decides that he wishes to become an orthodontist, then he should obtain a position which will give him this special training. This means the creation of a clinical rung in hospitals designed for post-graduate training as well as giving a service to the community. During this period he should be paid a reasonable income. As he proceeds up the specialist ladder, more semi-permanent positions should be available, so that the decision to go into private practice, specialist hospital practice, or the University sphere is not as difficult as it is now.

The picture I have painted may sound rather Utopian, but we are considering something like this in Melbourne. We have decided as a matter of policy to consider the dental graduate of the year 1990 as our target for the development of a new course. In this new course we have decided, as a matter of policy, to "remember" the patient so that dentistry can be taught in a teaching hospital with integrated departments. These will contain common clinical areas designed for most of the treatment of whole patients, where complementary service and teaching are given. Consequently, greater emphasis is being placed on oral diagnosis, including orthodontics. We have opted for maximum flexibility in the course and consider that Fourth and Fifth Year should be a continuous year, with students taught rather like interns in a medical teaching hospital. During Third, Fourth and Fifth Year students should be able to do an honours year,

and optional subjects must be introduced to give the course flexibility. This means a basic clinical course in which students must select some subject to study in depth. In the Final Year students should be expected to do a small research project as part of their practical work. Their results should be presented to the school as a whole in a lecture given by the student in his Final Year. We have opted to move more into the field of seminar and small tutorial teaching rather than formal lectures. We have agreed that less emphasis should be placed on prosthetics and a greater emphasis on other subjects in the dental course, including orthodontics. At the Master's level, students will be expected to do only one subject in depth, and this can be taken in two years full-time.

ORTHODONTICS

IN THE NEW CURRICULUM

Undergraduate Education.

How will the subject of orthodontics be taught in our new curriculum? Over the years orthodontics has been taught as a separate subject, but during the transfer to the new Dental School in 1963, orthodontics became the administrative responsibility of the Department of Conservative Dentistry. Since that time it has become more and more highly integrated into the teaching of the subject of Conservative Dentistry which now includes pedodontics, preventive, periodontics, restorative, crown and bridge as well as orthodontics. In Fourth Year, students are given a series of lectures and do practical work in the laboratory for a short period of time towards the end of the year. In Fifth Year they have clinical tutorials once a week for the entire year. Furthermore a part-time orthodontist is always on the clinic floor. This means that when students are working on patients there is an orthodontist in the background, teaching a class for an hour or so and then available for discussion with any student. In order to make students comprehend the whole patient, all students are required to diagnose their patients completely and then present the case to a senior member of staff with a complete oral diagnosis, including an adequate description of the occlusion and the appropriate recommendations from the orthodontist. On completion of work the patient is again presented in the oral diagnosis clinic. In this way the patient, student, restorative demonstrators and orthodontists are being examined continually.

We reject the proposition of a quantity type points system, for this merely trains

students to collect points, not treat patients, and have substituted a "quality points" system. Every time the student consults a demonstrator in the clinic he gains a mark. If he passes, it is nought; if excellent, plus one; and if inadequate, minus one. This system is devised to test quality not quantity; understanding, not technical ability, and encourage all dental teachers to continually check their standards against one another. The accumulated score is available for all to see on the clinic floor, so that throughout his period in the clinic the student can see where he stands relative to his colleagues.

Post-graduate Education.

Every graduate should experience some form of post-graduate education. However, at the end of five years the average student is aged 22 or 23, and biology being what it is, is almost certain to have become frustrated and be on the verge of matrimony or worse. This means that if he studies for a higher degree he must obtain financial support, and I believe it is in the interests of the community that he be given every encouragement. In Melbourne six training positions financed by the Hospitals and Charities Commission have been created, which are available for recent graduates. They are allowed to stay in these positions for up to three years and are expected to study for a higher degree during this time. Fifty per cent of their time is spent in the University areas, fifty per cent in Hospital areas. After a period students may elect to go into a special field; in the case of our embryonic orthodontist, this would be the orthodontic department. Here he would be expected to do first a Master's, and then, as the system is expanded, a Doctorate degree. His training would be carried out by both Hospital and University teachers.

RESEARCH IN ORTHODONTIC EDUCATION

The best form of education is research. Indeed, every time a student in a class performs some practical exercise he is researching under guidance, and finding out for himself what the effect of some factor is on another. The only difference between undergraduate and post-graduate education is that in the case of the undergraduate, the demonstrator knows the result, whereas in the case of the post-graduate, the supervisor of the project can only guide the project along lines he would consider reasonable. In effect, he does not know the result but his research experience and intuition have given him some better insight into the unravelling of problems than the student. However,

at the undergraduate and post-graduate level the principle of searching remains the same. This has been modified in our School by introducing an element of real seeking into the undergraduate course by asking the students to investigate small projects where the results are more or less known, but not quite. The fields in which they work are wide and cover sociology, materials, growth, epidemiology and biochemistry. At the end of this time the students are much more critical of their textbooks, of the claims made by manufacturers of materials, even of the academic staff. This is the attitude which will stand them in good stead in their professional lives and one which should be encouraged. Furthermore, it is an introduction to research into problems where the answers are not more or less known, and in this way we hope some of them will come into research at a more advanced level, taking what is but a natural step from undergraduate to post-graduate education.

CONCLUSION

By the year 2000, orthodontics must become one of the major subjects of the dental curricu-

lum, and be capable of providing an ever-increasing service to the community. If orthodontists cannot work towards this end, then, as science reduces the technical and logistic requirements of orthodontic treatment, the subject could be taken over by unqualified auxiliaries. There is a real danger here that the community will fail to understand our prime function, which is to decide what should be done, and substitute the technology of treatment as the major objective of orthodontics. Consequently I would urge you to look into the future and ask whether orthodontic education can take place in a vacuum, divorced from general dental education. To do this is to deprive the rest of dentistry of a basic science it needs so much for its future development.

Department of Conservative Dentistry
University of Melbourne
School of Dental Science
Cnr. Elizabeth Street and Flemington Road
Melbourne 3052.

"Many difficult problems confronting the general practitioner and orthodontist could be eliminated if preventive orthodontics were more thoroughly understood and practiced by all dentists who do work for children." Higley.