Doctor, TIC comes to you through the courtesy of your Ticonium Laboratory. The dental journal devoted to the dental team—doctor, hygienist, assistant.

MAJOR GENERAL ROGER HOMBS
ASSISTANT SURGEON GENERAL
FOR DENTAL SERVICES,
U.S. AIR FORCE
General Hombs entered active military duty in August 1946 with the U.S. Army Dental Corps at Ft. Sam Houston, Texas. Following completion of Medical Field Service School in September 1946, he went to the Philippine Islands and was assigned to the 12th Infantry Division at Camp O'Donnell, as division dental surgeon; in July 1947 he was assigned as Chief of Dental Services, 46th Station Hospital, Clark Field, Olathe, Kansas, and three years later was reassigned to the 2577th Air Force Reserve Flying Training Center, Brooks Air Force Base, Texas, as base dental surgeon. In September 1955 he went to the 6607th USAF Hospital, Thule Air Base, Greenland, as Chief of Dental Services. In September 1956 General Hombs was assigned to Sewart Air Force Base, Tennessee, as base dental surgeon. In June 1958 he became Deputy Command Dental Surgeon, Air Training Command, Randolph Air Force Base, Texas. He went to Altus Air Force Base, C.Z., in 1961 as Dental Surgeon, Caribbean Air Command. In July 1963 he was assigned as Chief of Dental Services, USAF Hospital, Carswell Air Force Base, Texas. In May 1965 General Hombs became Command Dental Surgeon, Air Force Logistics Command, Wright-Patterson Air Force Base, Ohio, and in June 1966 was assigned as Command Dental Surgeon, Tactical Air Command, Langley Air Force Base, Va.

In January 1967 he was appointed Deputy Assistant Surgeon General for Dental Services, Office of the Surgeon General, Headquarters U.S. Air Force, Washington, D.C., and in August 1970 to his present position.

His two-star promotion to Major General took place on August 1, 1972, the same day that the Air Force's new Surgeon General, Lieutenant General Robert A. Patterson, assumed office.

General Patterson and Mrs. Hombs pinned the two stars on General Hombs.

Published weekly by COMPANY
Dentists of CMP Industries, Inc.
Albany, New York

Editor: Joseph Strock
Contributing Editors: Arthur N. Levine, D.D.S.
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Cover Artist: Edward Roper

A MAGAZINE FOR DENTISTS, DENTAL ASSISTANTS, AND DENTAL HYGIENISTS

How to Avoid Those Physical Strains
by Arthur L. Levine, D.D.S.

The young dentist starting his career seldom pays any attention to the physical strains of dental practice. He is so filled with a zeal for his work and usually enjoys such a sense of well-being that he is convinced that he can handle any physical tax that his profession may impose.

After all, how do you advise a person in his thirties about bad habits that may cause trouble in the sixties? It is all too remote. Or his reaction may be: "It doesn't happen to everyone and it won't happen to me."

Well, not too many of us die at a young age, yet most of us do buy some form of life insurance as protection against that remote possibility. And so it is in dental practice. Good early habits based on an understanding of what the body likes, and what the body does not like, may provide insurance against certain chronic ailments which plague many of our fellow practitioners in their later years.

Sitting or standing. For many, many years dentists worked standing. That is the way they were taught to work in dental schools. Once in practice, some of the men tried sitting on a stool. Although the services performed on the stool were quite limited (like reshaping an inlay in the hand), the operating stool became the leaning forward position was just another example of the good early habits based on an understanding of what the body likes, and what the body does not like, may provide insurance against certain chronic ailments which plague many of our fellow practitioners in their later years.

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They were simple, upright stools, some of which could lean in any direction while the operator remained seated. But they had no back support. That came later.

The leaning forward position was just another example of the philosophy then in vogue. The dentist adjusted to the patient. Although students in the school clinics were advised to raise the chair, tilt the chair, or change the head position to make it easier for the operator, generally speaking most men were working in a bent-over position.

Today's Approach
Today the attitude has changed. The patient's position is adjusted to suit the operator. Most of the schools teach the student to work sitting down, behind the head of the patient, while the patient is placed in a supine position almost parallel with the floor. In effect, the head of the patient is in the lap of the seated operator. Again, the objective is to make the dentist comfortable.

Why all the stress on sitting? Because experience has proved

Left Photo: Dr. (General) Harvel Graber, Chief of the Orthodontics Division, is assisted in evaluating a dental patient. He is a member of the Air Force Centro-facial Assembly Team that travels all over the world treating cranio-facial anomalies. Right Photo: A dental laboratory of RAF Leuchars, England.
comfort getting out of a chair in which he has been on transatlantic flights knows the feeling of remaining reading for some time.


The secret is the word "change." The body likes change. Standing too long is bad. Sitting too long is bad. Even lying in bed (the most restful position we have) is bad if it is excessive. Ask any patient confined to bed for long periods.

Getting back to the operator who is seated behind the head of the patient, it must be emphasized that he must not remain seated for long stretches. Some men boast of the fact that they get up from the stool in one room and go directly to the stool of another where the next patient is ready. This is productive but not satisfactory. The dentist is not a machine.

Some men practice quadrant dentistry. This means that they try to do everything needed in one quarter of the mouth. Again this steps up the efficiency a little, particularly if Novocain is used. Still other men like to work on one patient for long periods, an entire morning, for instance.

Change Is the Magic Word!

Both these groups are violating the important rule of change. All their operating time is spent in a seated position. The only relief comes from changing patients and washing hands. The one patient a morning is the worst offender unless the operator makes it a point of giving the patient and himself a break. But if the operator is using general anesthesia, as a few operators do, he feels obligated to finish everything as quickly as possible. That means a long session.

The shorter appointment, on the other hand, is better physically for the operator. With half-hour or fifteen-minute sessions the opportunities to change from a fixed position are more numerous. Some men dislike the fifteen-minute appointment, however, because of the strain of meeting a deadline every quarter hour. They also insist that it is less productive in view of the need for temporary fillings. This is a decision each man must make for himself.

Again, the important thing to remember is not to sit or stand too long. The ability of the body to adjust to almost any position is quite remarkable, provided it is not overworked.

The policeman directing traffic all day, standing, is frequently afflicted with the same hemorrhoidal problems as the bus driver who works sitting. If they could mix jobs, they would both be better off.

To repeat, a dentist can work in any position he likes if it is not a sustained effort. And in the choice between sitting and standing, it is important to do both, with a majority of the time given to sitting.

Three-Zoned Work Area

Dr. Harold Kilpatrick, of Connecticut, has been a strong advocate of this technique and a popular lecturer. He has divided the workable area into concentric zones with the operator in zone 1, in the middle. Zone 2 is larger and zone 3, the largest, the outside zone.

According to Dr. Kilpatrick, the operator should confine his movements to zone 1, which includes the patient's mouth. Reaching into a drawer or towards a bracket table would bring him into an outer zone. This means he is stretching and he must not stretch or bend or lean. The assistant places everything he needs in his hand. And if another assistant is working the powerful aspirator (with the patient that far back, it is essential to keep the mouth free of fluids) you have six hands occupied.

On the face of it, it sounds as ideal as a hospital operating room where a surgeon does only the work that requires his expert skill. Everything else is handled by assistants. In the dental office this may also apply in producing the maximum amount of the operator's skill in a given time.

But this article is concerned with the physical well-being of the practicing dentist, not his ability to produce more work. From that point of view, all is not as rosy with the new sit-down technique as it appears.

Operating from a sitting position for long stretches is not good, just as sitting in one place for a long period is not good. Anyone who has been a passenger on transatlantic flights knows the feeling of remaining in one position too long.

Even at home an older person may have some discomfort getting out of a chair in which he has been reading for some time.

An Orthopedist's Advice

There is no disagreement among orthopedists concerning operating positions for the dentist. Dr. Stewart Hershon, a Long Island orthopedist, puts it this way: "A dentist is better off if he combines standing and sitting in this proportion: roughly two-thirds sitting and one-third standing."

The man who directs the global Air Force Dental Services is Major General Roger Bombs, Assistant Surgeon General Dental Services. He enjoys a unique reputation as an exceptional leader, an innovative administrator, an excellent dentist, and a nice guy. The reputation comes from those who have worked in the Service with him for years.

To add a few more personal facts before getting to his official biography: he has a Homerian sense of humor and is a multiple hobbyist—fishing, photography (prefers 35mm), historical novels and biographies, sightseeing (historical), classical and semi-classical music, and prefers sculpture to painting. His overriding interest on the job and off, however, is improved management techniques for the Service, all geared in on better dentistry for the patient.

He is married to the former Marie Cecelia Powell of Wood River, Illinois. They have two very attractive daughters, Peggy Lee and Mary Ellen, on whom they dote. All members of the family are active in church affairs. They live at 7211 Ft. Hunt Road, Alexandria, Virginia.

To pick up the official biographical data on General Bombs:

He was born in Keokuk, Iowa, on November 29, 1922. In 1933, the family moved from Glenwood, Mo., to St. Louis, where he graduated from Grover Cleveland High School in 1940, and received his doctor of dental surgery degree from the School of Dentistry, Washington University, in 1945. He was in private dental practice and served as assistant clinical instructor in dental medicine and radiography at Washington University from October 1945 until July 1946.

Major General Roger Bombs, Head of The USAF Dental Service

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to its existing preventive program, the purpose being healthy oral environment and to teach each eligible tistry program. Recently, all Commands were notified school programs, and the children's preventive-den­
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Dentistry has long recognized the value and importance of a preventive dentistry pro­
gram as a means of reducing the evidence of dental disease. The importance of prevention is greatly stressed throughout the Dental Service. The preven­tive-dentistry programs include not only the oral prophyaxis and associated anti-cariogenic treatment; they also include patient-education programs, fluoridation programs for base water supplies, dependent school programs, and the children's preventive-den­tistry program. Recently, all Commands were notified that the Dental Service would immediately incorporate a planned program for the control of dental plaque in­

A Look at the Future

"In the future the Air Force Dental Service will continue to provide the finest dental care on a world­wide basis as required," a spokesman said, "using the resources at our disposal and the talents of the fine men and women who compose our service. The pa­tient will be the recipient of outstanding care as in the past and will also benefit from the introduction of in­novative treatment programs, new techniques and materials, and new concepts. We see the advantages accruing from the practice of four-handed dentistry; expanded utilization of auxiliary personnel; the pre­ventive programs encompassing plaque control and the fluoride program; the automation of dental rec­ords and reports; improved facilities and materials, specialty care from highly-motivated and highly­skilled dental personnel, and the continuing emphasis on dentistry as a key factor in total patient care. The future undoubtedly holds changes and advances that none of us can envision today. However, the founda­tion is laid and our position is secured and we in the Air Force cannot help but believe that the future looks bright for dentistry."

(Photos by USAF)

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Yet, with amazing consistency, we fail to recognize the arch enemy of our profession—dental caries, I am not referring to those interproximal lesions which are readily seen on radiographs or that sometimes sub­tle carious catch on the pit or fissure of a molar. We

As dentists, we often are presented with rather dif­ficult diagnostic situations. To varying degrees, we have developed diagnostic expertise in all branches of oral pathology. Our journals are replete with cases which demand oral diagnostic skills of the highest order.

Yet, with amazing consistency, we fail to recognize the arch enemy of our profession—dental caries, I am not referring to those interproximal lesions which are readily seen on radiographs or that sometimes subtle carious cleft on the pit or fissure of a molar. We do quite well, in diagnosing those lesions.

Dr. Castano is Assistant Professor and Chairman of the Department of Pedodontics, University of Pennsylvania School of Dental Medicine. His interesting article appears here through the courtesy of the Pennsylvania Dental Journal.

However, if we examine a child under three or four years of age with carious lesions on the buccal, lingual and cecaluald of the molars, labial of the cuspids and labial and lingual of auxiliary incisors, our problem is magnified.

Our thoughts immediately run to dietary deficiency (strange the rest of the child seems to have escaped the affliction), or terraceline staining (od that the stain looks remarkably like decay), or perhaps high fever during early infancy (does it not appear dis­concerting that areas of teeth which were calcifying over a several-month period all seem to be affected). The list goes on—thyroid deficiency, hereditary factors, thalassemia, ad infinitum, ad absurdum.

Now it is possible, (not very probable) but possible, that sometime you may come across a case of exten­sive decay in the preschool child which is caused by a teratogen which struck prematurely and rendered the dentition highly susceptible to decay. And it is also possible, but again not probable, that the child will be completely free of any other signs of a systemic affliction. But these cases are quite rare and in a differential diagnosis, a systemic etiology of rampant decay would be a distant second choice. The etiology of choice is generally readily recognizable if we know where to look.

To illustrate a point, let us look closely at the prob­lem. First, we obviously are observing decay. It cer­tainly looks like decay and feels like decay and even smells like decay. Secondly, it appears to be covering widely divergent areas all over the mouth with the possible exception of the lower anterior. Lastly, the enamel which remains intact is quite natural in appear­ance and the intact enamel also seems to be dis­tributed throughout the mouth with little regard to calcification sequence. It should be noted, however, that some areas of enamel will be in varying stages of decalcification.

From these observations we should be able to pre-
file our problem. We have dental decay of a rampant nature which is attacking normal teeth and with no obvious evidence of systemic disease.

Our task now is to identify the primary factor or factors which allow such rampant decay to develop. Now should we ask the average school child what causes tooth decay, they will joyously parrot "sweets." Their minds have not been cluttered with some of our more sophisticated facts and theories. Allowing ourselves the luxury of accepting a "sweets or dietary etiology, it is only necessary to ferret out the specific source of carbohydrate. One such insidious source of carbohydrate is the nursing bottle. With children under three years, decay of a rampant nature can usually be traced to one source. The most common source of refined carbohydrates for this age group is the nursing bottle with either milk or other sweetened liquids. I never cease to be amazed at the wide spectrum of cariogenic liquids parents (or grandparents) can dream up to put in that bottle. And when this is continued past 12 months, usually in the form of a nap or night bottle, a definite decay pattern develops. This pattern is most commonly known as "nursing bottle syndrome" or "bottle mouth" caries.

The parent will usually readily admit the use of the nap or night bottle and express surprise that this could possibly be the cause of such extensive destruction of the maxillary deciduous teeth. But the real culprit was never counselled by their family physician or pediatrician on such a vital point. I must admit that I too am somewhat amazed that while detailed advice is given to the parent concerning the diet of the young infant, little or no dietary information is offered once the child is taken off a formula.

With little doubt, the nursing bottle can be a most vicious and relentless cause of early childhood decay. The child subject to the nursing pattern has the problem further complicated by the marked decrease in salivary flow which always accompanies sleep, while the high carbohydrate level of the milk provides an effective substrate for the aedigenic microorganism implicated in plaque formation and smooth surface decay. In addition to the milk, most juices are often used in bottles, such as apple and orange juice, also provide a high level of carbohydrates.

Decay Pattern

The distribution of decay for nap bottle syndrome follows a classic pattern. The maxillary incisors are usually heavily involved with circumstellar decay, the occlusal and cervical areas of the primary molars and the cervical third of the labial surfaces of the cuspsids may be involved. (See photo) Typically the decay progresses rapidly and the parents will state that the teeth appeared to melt away. Often the maxillary anteriors fracture off. Another classic sign of this decay pattern is the relative absence of decay on the mandibular anteriors. It is felt that the positions of the tongue, nipple of the bottle and/or Whartons duct act to give this area protection. However, decay in this area in no way precludes the extended use of the nursing bottle as the primary cause of the decay.

Other causes of rampant decay in the young child may be the frequent ingestion of medication containing a sugarbase or the plain undiluted over-indulgence in high saccharine-containing foods especially frequent between meal snacking. Extensive decay from these sources is usually not as rampant and seen somewhat later than that caused by the nursing bottle. In short, any cases of extensive decay in preschool children should be assumed to be caused by dietary factors and, for children between 18 and 30 months, the specific cause will most probably be due to a prolonged use of a nursing bottle. Only in the face of definite evidence of systemic involvement or a definite history of a general teratogen should the dietary etiology be abandoned.

We all have experienced rampant decay in the young child and we are all too aware of the tremendous expenditure of treatment time in addition to the trauma inflicted on the child during the restoration of these carious mouths. It is obvious that the most effective weapon we have at our command is prevention. But for the most part we must depend on others to deliver this particular preventive message to the parents. These others are primarily the family physician and the pediatrician. Each and every one of us must collectively and individually get the message to our medical colleagues. This does not, of course, relieve us of the responsibility of informing the parents directly, but all too often we are called on the scene only after the fact.

Those of us who know the editors of medical society news letters or other similar publications should investigate the possibility of using this means of getting the message across. Any chance you have to speak before groups of physicians, nurses and others will provide an opportunity to mention this syndrome. A

Widespread Training Program

Training of Air Force dental personnel covers the entire spectrum of specialties, including long-course training leading to board certification; short-course or postgraduate training; refresher or continuation training. The Air Force has 40 dental officers in rotating internships and 36 in residencies at Air Force hospitals. There are 56 in residency training in civilian institutions. In addition, we have 25 officers attending dental school under a fully sponsored dental education program. Education of enlisted members includes the annual training of 209 dental laboratory
Put Pizzazz in your Practice

by Maurice J. Teitelbaum, D.D.S.

Recently I attended a seminar on practice management given by one of the profession's leading authorities on the subject. He was a dynamic and inspirational speaker who covered every facet of the subject from goal setting and self-motivation to case presentation and the composition of "nasty letters" for delinquent accounts.

One of the interesting things he touched upon was the need for "flair" in the dental office. By flair he meant that extra something that makes a dental office or dental experience not only memorable but worth telling to a friend—thereby possibly recommending another patient to the practice. However, we feel that the word "flair" is too mild; it doesn't sparkle and it really is not descriptive enough. We'd like to think of that audacious, daring, and inventive quality that really is pizzazz.

"Pizzazz" means that extra something that makes a dental office... 

...collectively, local societies can develop a simple mimeographed sheet to be distributed to the offices of members as well as those of local physicians and hospital waiting rooms. There are a number of ways to spread the warning about prolonged use of the nursing bottle and when one considers the needless suffering... 

...the diet you give your child will assure you these teeth will erupt strong and healthy. If you know sometimes that is desirable (make the consumption of the bottle drinking water)... 

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...several factors occur which cause this problem.

1. The child often falls asleep while taking the bottle.
2. As we all know the flow of saliva decreases during sleep. (Saliva dilutes the milk in the mouth and aids in digestion).
3. The milk coats the teeth and remains there throughout the night (or nap). This milk coating and aids in the decalcification of the teeth (the start of decay).
4. If you must give a bottle at night (and as parents we know sometimes that is desirable) make the contents of the bottle drinking water.

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References

DO people say what they mean—or mean what they say? With the advent of the credibility gap, it's getting increasingly more difficult to take people at their word. Politicians, in particular, are difficult to understand. Maybe it's because they have such poor memories and can't recall on Friday what they said on Wednesday. Someday, if you get caught in the rain, step into the library and glance through the front pages of your local newspapers published over the last eight years. It beats the best show in town. Why, you'll find that just on the subject of Vietnam and the economy our leaders have made more changes than a nurserymaid with three sets of week-old quadruplets. It's hard to believe that they meant what they said, or what they mean. Unfortunately, it's even difficult to accept the word of a friend. The next time you're in a poker game, you just know that someone is trying to pull the wool over your eyes. "Fist bump"—and the guy will be Max, Harry, or George. And when someone says, "It's late," you can be sure he hasn't even looked at his watch and knows he is going to plant his winnings and leave. Funny, but a loser in a card game never worries about the lateness of the hour.

Handwriting?

With all of us on the brink of Babel, how can we begin to understand our patients? Graphologists would have us believe that people reveal their true selves in their handwriting. Well, we tried this in our office, having our patients write us notes, but I would have us believe that people reveal their true selves in their handwriting. Well, we tried this in our office, having our patients write us notes, but I would have us believe that people reveal their true selves in their handwriting. Unfortunately, it's even difficult to accept the word of a friend. The next time you're in a poker game, you just know that someone is trying to pull the wool over your eyes. "Fist bump"—and the guy will be Max, Harry, or George. And when someone says, "It's late," you can be sure he hasn't even looked at his watch and knows he is going to plant his winnings and leave. Funny, but a loser in a card game never worries about the lateness of the hour.

Body Language?

Recently someone came up with body English, understanding people by the way they sit or position their arms or legs. In desperation we gave it a try. But we gave up when a comely female patient caught us staring at her crossed legs to ascertain whether she was relaxed or nervous. She was neither—she was angry. That ended our brief course in body English.

Facial Expressions?

Now, a learned psychologist has said that an individual's expression is a tip-off to his personality, that the face mirrors the soul. Most of us are too busy trying to listen to what a patient is saying, so we miss the expression on his face. But if you can manage to do both you may learn what the patient means, says the good doctor. For example, he says that a patient shows distress when the "eyebrows turn upward on the inner side." This is hard to do voluntarily but in a distressed situation the reaction occurs without any effort. Then, when a patient is angry the eyebrows curve down on the inner side. If you happen to have a patient whose eyebrows simply come off—the chances are he's angry and distressed. Now, surprise is easy to detect; eyebrows or no eyebrows: the patient just sits up and says, "Are you kidding, Doc?"

When a patient feels contempt this is supposed to be shown by the flaring or widening of the nostrils. However, this can often signal a forthcoming sneeze; but who knows. According to the learned doctor, the "pulling of the mouth up and down" is a smile registering happiness. The last time we pulled a patient's mouth up and down to fit a tray, the patient was anything but happy. Fear can be noted by a lack of white shining in the eyes, the doctor says. I hate to disagree, but the last time we accidentally got plaster around a patient's eyes it wasn't for fear I saw but disgust. So, there goes another theory.

Maybe the only way we can get to understand each other and break out of the credibility gap is simply to be honest, to tell it like it is. We can't appear different from what we are or cover up our ignorance.

New Tax Rules for Casualty and Disaster Losses

Because of the torrential rains and floods occurring this year in the east and midwest, there has been an easing in the tax rules for losses in disaster areas. Other new rules for claiming loss deductions give a better break for all casualty loss claims. Those of you who have your dental practice and live in an area that has been designated as a disaster area by the President can now claim a deduction in your previous year's income tax return for a loss that occurred at any time during the tax year, due to the designated type of disaster loss in that area. Formerly, only a disaster loss occurring within the first six months of the tax year could be deducted in this manner.

The act can be amended by your previous year's income tax return for a refund. This will provide some fast relief for those of you who have sustained a disaster loss, and make recovery somewhat easier.

If the disaster loss is large enough, it may result in a net operating loss in the year it is claimed. In that case, under net operating loss tax rules, the loss can be carried back three years for a refund. If this does not use up all of the loss, it can be carried forward to the next five succeeding years in the order of their occurrence. These same rules for net operating loss also apply for other casualty losses that exceed the tax for the year they are claimed.

Those of you who sustains casualty losses not due to a disaster, either in areas not designated disaster areas or in disaster areas, can also take steps to get some tax relief. There are two courses of action that will give some benefit in helping to bear the loss.

You may have substantial losses, but still have considerable tax left to pay for the deduction. However, the deduction will materially reduce your estimated income tax and your quarterly payments. If the disaster loss is large enough, it may result in a net operating loss in the year it is claimed.

Filing this, the sooner the supporting records are round up, the better the chances that the full amount of the loss will be claimed, and that adequate records will be on hand for substantiating the claim.

If there are pictures of the property destroyed made previously to the casualty or disaster, this is helpful. Also pictures taken immediately after the occurrence of the casualty or disaster. All bills for repairs and cleanup should be kept, and any receipts for proof of costs paid out. Records showing the value of the property should be included.

For disaster losses, the portion of a federal disaster loss that is cancellable under the Disaster Relief Act of 1970 is considered "other compensation" for the loss. In general, the portion that is considered cancellable is the excess of the principal amount of the loan over $500, with a limit of $2,500 on the amount cancellable. This portion is applied to adjusting your loan for tax purposes, reduces your loss deduction.

Ideally, evidence to support a casualty or disaster loss deduction should be obtained immediately after the loss occurs, when it is still fresh in the memory.

Whether the loss is due to a disaster, the amount of the loss can be determined as a refund. This will provide some fast relief for those of you who have sustained a disaster loss, and make recovery somewhat easier.

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ounces in weight—yet Hall has managed to pack
some 50 separate parts into this small instrument
and develop a torque even at 100,000 rpm some 20
times that of your high-speed air turbine.

Unique and hitherto unknown drills had to be
developed: devices with shields so that, for example, the
special instrument for craniotomies could cut through
the skull and still have a flat foot underneath the bone
to prevent tearing or injuring the dural membranes
or the brain tissues themselves while sawing out a
piece of the cranium so that the neurosurgeon can get
in to remove a tumor or suction out an abscess or tie
off an aneurysm. In fact, so delicate are these instru-
ments in operation that they can cut through the shell
of a fresh egg without damaging the delicate mem-
branous tissue beneath, and can remove the outer-
most layer of the egg shell without cracking the shell
itself. This precision of handling has made these air
instruments valuable in many areas of surgery, and
that goes for oral surgery as well.

The delicacy, safety, and precision of use has op-
ened the way to newer, more difficult, and safer spin-
al and hand surgery—to name just two fields. Where
there is spinal compression due to either a herniated
disc or tumor, the combination of Hall's high-speed
instruments with his specially designed protective de-
vices which fit over the bur permit the removal of the
every laminæ without damage to the spinal cord
or producing dural tears; and these same characteris-
tics make possible the surgical repair or the brain tissues themselves while sawing out a
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For the heavy bone cutting such as craniotomies,
and similar work, Hall has developed another instru-
ment—the Craniotome. It is actually a vane-type air
motor rated at 1 1/6 hp. Using nitrogen at 160 p.s.i.,
it operates at 20,000 rpm and provides considerably
more torque than the Air Drill, but is also larger,
particularly in diameter and weight. With this instru-
ment the neurosurgeon can cut a craniotomy—make a cran-
ial bone flap—in less than two minutes as compared
with over an hour for the old hand methods, which
often left the patient tired and hand-weary before he
was even ready to start his real work—the attack on
the brain tumor or abscess or hematoma.

And, finally, there is Hall's orthopedic instrument:
its air-vane motor utilizes a three-stage planetary gear
train to cut the speed down to 350 rpm or less and
boost the torque by an almost unbelievable ratio of
64:1, thus providing the large amount of torque need-
ed for such bone procedures as drilling, reaming, saw-
ing the upper malar areas. Making the tooth or
molar root—carving the crown and finishing the root
in one instrument. This unique family of instru-
m ents has actually opened a whole new world of surgery: devices
used by a Pittsburgh surgeon to carve and free an aortic valve im-
mobilized by calcification; employed by a New York surgeon to
remove a tumor in a large bone; and used by a New York surgeon
for the removal of a tumor in a bone flap. The hall was ready to start his real work—the attack on
the brain tumor or abscess or hematoma.

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Hall Air Drill. The great plastic surgeon concluded his letter with what so many others have since echoed in one way or another: "I congratulate you upon the introduction of this drill, which a surgeon may use with the gentle ease of the artist's brush in the accomplishment of the most difficult and challenging problems in sculpture."

And it all evolved from the fortuitous combination of an unsuccessful arm bone graft on a dental student and his later unhappiness with the old hammer-and-chisel approach when he became an oral surgeon. Mix these with the discovery of the dental air rotor and the unusual inventive mind of that young oral surgeon, Dr. Robert M. Hall, and you have all the ingredients for the founding of the new world that was to become known as "air instrument surgery."

When Bob Hall attended the Chicago Mid-Winter Dental Meeting in 1957 he saw his first air rotor and it intrigued him. He started fooling around with it for oral surgery and even published a paper on it in the Journal of Oral Surgery after using it on more than 200 cases. But it was soon clear that the dental handpiece was not the device he was looking for. It lacked adequate torque for bone surgery, needed water which could not be poured into an operating area without introducing infection, required electricity which introduced a hazard of explosion into the operating room with its explosive anesthetics, and, finally, the burs of inadequate length and wrong design.

Now came the design and development of a family of instruments which were to be driven by air and not electricity, to be able to cut without a flow of coolant onto the bur and to range from high-speed instruments with enough torque for heavy cutting, down to ones slow enough to be able to ream or drive screws for bone repairs. Torque had to be adjusted to the operation, stall characteristics had to be built in to provide a good safety factor against the possibility of stripping the threads in the bone, fingertip controls had to be worked out instead of the conventional dental foot controls, and new sizes and shapes and lengths of burs in hardened tool steel, carbide, and even diamond instruments (to tolerances of 1/500 of an inch) had to be dreamed up—for this new line of surgical instruments was to be adaptable to more than 500 surgical procedures and to be used in place of some 100 different instruments (everything from a screwdriver to a brace-and-bit, from a chisel to a mallet, from a pinpoint drill to a saw).

And, to make matters harder, the whole device had to be autoclavable, meaning new materials and metals with new techniques of lubrication, for neither coolants nor lubricants could be allowed to be driven into or escape into the tissues operated on (the brain and the spinal cord to name but two) deep within the body.

Before the R & D phase (the research and development) had been completed, more than 15 firms had been brought into the complex picture, with Bob Hall (a dentist, remember, with no engineering training) having to coordinate all this, along with the necessary inventions and the financial and sales problems as well. The result was the use of such Space Age metals as titanium, and seals so perfect that the instrument could safely be autoclaved. A brake had to be devised so that the 100,000 rpm instrument could be brought to a dead halt in a fraction of a second, and the tiniest turbine known had to be developed—one with the enormous power of a jet engine! Ball bearings were manufactured so small that they were the size of pinheads, a circular race containing a full set of these bearings is the size of a bird shot. The first of the family, The Hall Air Drill, is little more than 5 inches long, 5/8 inch in diameter, and 6 ounces in weight. It contains 50 separate parts, and can develop a torque, even at 100,000 rpm, approximately 20 times that of your high-speed air turbine.