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EDITORIAL

The Little People

International Year of The Child began in Singapore on a grim note. Set aside to look into the welfare of children, 1979 was still in its infancy when Singaporeans were shocked by reports in the media of the murder of four children in a family. Soon after came news of the rape and murder of a little girl. Like children elsewhere, our little ones are defenceless when their bodies fall prey to violent crime but unlike many children elsewhere they have a headstart in life.

To begin with they are endowed with a life expectancy at birth of 60 to 70 years, a figure comparable to that of many advanced countries. This is in no small measure due to a health care delivery system that is

extremely cost effective. The Singapore Government only spends about 4% of the National Budget on health. Individual expenditure for health is about the same level as indicated in the last Economic Survey (\$12 out of every \$380 per person per month). Despite the low priority accorded health by both government and individual and a doctor-population ratio of 1 : 1260, the Infant Mortality Rate (always a good index of the quality of medical service) in Singapore has fallen in less than 2 decades from 31 to 14 per thousand. This figures compare favourably with those of many developed countries both Western and Asian where 2-figure percentages of the National Budget are allocated to

health and where the doctor-population ratios stand at 1 doctor for less than a thousand population.

Many reasons are responsible for this. Among which must be included sound decisions by our policy makers who realise the importance of improving the environment *pari passu* advance in medical treatment in keeping disease at bay. Of equal importance is the establishment of a concerted programme in Paediatrics training in the medical school both at undergraduate and postgraduate level.

The availability of expertise in child medicine has seen a decrease in the infections as major causes of death and their replacement by malignancy and congenital malformations. The latter may be pared further with advances in corrective surgery and genetic counselling. Last but not

least is the decisive step taken by the Government on family planning. It became official policy by Act of Parliament in 1966. Thenceforth, the 2 child family has become the accepted norm. Those who dare have more than 3 are levied disincentives. With this control in population growth, Singapore can avoid a geometrical escalation in health expenditure and give more to less.

While their physical health is looked after by an effective health service and their social well-being protected by laws such as those against child labour and exploitation, the mental well-being of Singapore children may be far from healthy. The Singapore child has never been better clothed, better fed or healthier than before. Ironically, he has never been in greater stress than now especially

in his education. He has to contend with bilingualism, extra curricular activities and strive hard to be in the top 8% to gain entrance to an elite school. He often goes to bed and wakes up to find yet another change in our mercurial education policy. Although we do not have the periodic and seasonal increase in child suicide coinciding with the release of examination results or announcement of admission to institutions of higher learning as seen in Japan or Germany, the morbidity arising from this cannot be ignored. Child psychiatry and psychological medicine are in the infant stages of development in Singapore. It would be interesting to see the pattern of child psychiatric problems evolving here. Already there are indications that a problem does exist.

Tenth SMA Annual Convention

The 1979 Singapore Medicine Association Convention celebrates the tenth in the series of annual conventions since its inception. It promises to be a milestone, for it will differ in several major respects from previous meetings.

As a result of an agreement between SMA and a leading international professional convention organiser, Interfama, to hold the convention in conjunction with "Medic Asia", an exhibition of medical and hospital equipment, the convention will be held at a hotel.

Several overseas speakers have been invited, through the sponsorship of Interfama, to participate in the scientific programme.

The exhibition itself will feature a wide range of medical equipment, and will have participation from a large number of organisations.

The Convention, from March 20 to 24, at the Hyatt Hotel, will be declared open on March 20 by the Senior Minister of State for Foreign Affairs, Mr S. Dhanabalan and will be followed by a reception.

The honour of delivering the SMA Lecture this year goes to Prof Wong Hock

Boon, Professor of Paediatrics, University of Singapore, in recognition of his outstanding contribution to health and medical education over the years. He will discuss "The Significance of Abnormal Human Chromosomes in Singapore".

On Wednesday, March 21, Mr Robert Trew a hospital planning consultant from UK, will speak on "Planning a New Hospital". With several new hospitals coming up in Singapore and the neighbouring region, this topic should interest many hospital administrators planning consultants, architects, engineers, builders, as well as medical and nursing personnel. This will be followed by a talk on "Hospital Planning and Research in Developing Countries" by Dr Mohd. Zaini bin Abdul Rahman, Head of Chemistry, Institute of Medical Research, Kuala Lumpur, Malaysia.

The recent Spyros incident raised many questions about the management of mass disasters, and a symposium on this topic will attempt to provide some answers. Chaired by Dr V K Pillay, Master of the Academy of Medicine, the speakers will comprise Dr

Lim Swee Keng, Head, A & E Unit, Dr Tan Seng Huat, Senior Anaesthetist, Prof. Kamal Bose, University Department of Orthopaedics, all from the Singapore General Hospital, and a visiting internationally well-known orthopaedist, Dr Alain Patel.

With many new developments in medical technology appearing so frequently, it is difficult for the average medical practitioner to keep up. The Symposium on "Biomedical Instrumentation" on Thursday, March 22, is therefore timely and will bring the practitioner up to date on some of the most significant recent advances. No one should pass up the chance to hear Dr Kreef himself, the originator of Computed Axial Tomography, talk about one of the most important advances in radiology in the last 20 years.

An internationally acknowledged expert, Prof McAslan, from the USA, will discuss the "Automated Monitoring of Critically Ill Patients", an area of interest to all involved in the intensive care of patients.

A series of "quickie" papers by local experts will discuss the basic principles and

applications of some recent techniques now in common use, viz. echocardiography (Prof Chia Boon Lock), fiberoptic bronchoscopy (Prof Teoh Pek Chuan), Ultrasonography in Obstetrics and Gynaecology (Dr S C Chew) and radioisotope scanning (Dr Chang Chin Hian).

Drug abuse has emerged as a major social problem only in recent years so that only a few physicians have had first hand experience in dealing with it. It is obviously not a conventional medical problem but one with many complex social and cultural interactions. The highlight of the Scientific program will be two symposia on the "Social Aspects of Drug Abuse" and the "Medical Aspects of Drug Abuse". Special guest speakers for the first symposium include Mr Baey Lian Peck, President, Singapore Anti-Narcotics Association, Mr Tee Tua Ba, Director of the Central Narcotics Bureau, YAB Dato Rais Yatim, President of PEMADAM, Malaysia and Dr Hollinrake, Superintendent of the Shek Kwu Chau Treatment Centre in Hong Kong. Speakers for the second symposium will include Prof

Yeoh Teow Seng, University of Singapore, Dr Paul Ngui, consultant psychiatrist and Prof Leong Hon Koon, University of Singapore. Ample time will be given for discussion and all doctors are urged to avail themselves of this opportunity to discuss the many facets of this problem with our speakers, as well as to describe their own experiences.

The Committee on Drug Abuse will take advantage of the opportunity to put up some exhibits on "Drug Addiction" outside the Stamford Room at Hyatt Hotel, where all the scientific sessions will be held. The exhibits will include "Diagnosis", "What happens to someone found to have contravened the Misuse of Drugs Act", "How the SAF deals with the problems of drug abuse" and "Where to seek help".

The Organising Committee for the Tenth Convention has gone to great lengths to put up an interesting and relevant scientific programme. We hope our members will not disappoint us and turn up in full force!

Remember the dates of the Convention: March 20 to 24. Keep them free!

SYMPOSIDIA - EXHIBITION

YELLOW PAGES

Members are once again reminded that it is unethical to pay for extra insertions in the Yellow Pages of the telephone directory. Those who have made such payments for extra insertions are strongly advised to have them withdrawn. The relevant section of the SMA amended Ethical Code on telephone and local directories are quoted below:

"The entry should appear in the ordinary small type. No special type or special entry should be permitted for a doctor and his private clinic or dispensary.

If professional telephones are listed in the Telephone Directory under the heading "Registered Medical Practitioners" there is no objection to this on ethical grounds, provided it is not dependent on a fee."

by Committee on Drug Abuse

Medicine and Society interact in many areas, such as industrial injuries, diseases related to occupations, road traffic accidents to name a few. A fourth is drug abuse, and this has been chosen as the subject for two symposia and an exhibition in this year's S.M.A. Convention.

Those who missed last year's exhibition on drug abuse held in March in the Alumni can see it again in this year's exhibition. In addition,

doctors can see what happens to National Servicemen who take drugs. This is very relevant for after discharge, they may turn up in our clinics. It is necessary to have some background knowledge of what the National Service drug abuser has undergone. The material was processed by Col. (Dr) Seet Lip Chai, Chief Medical Officer, SAF, and member of the SMA Committee on Drug Abuse. It is the intention of SMA

Council to donate this part of the exhibition to the Singapore Armed Forces for their use once the SMA Exhibition is over. The exhibition will be held on the first floor in Hyatt Hotel.

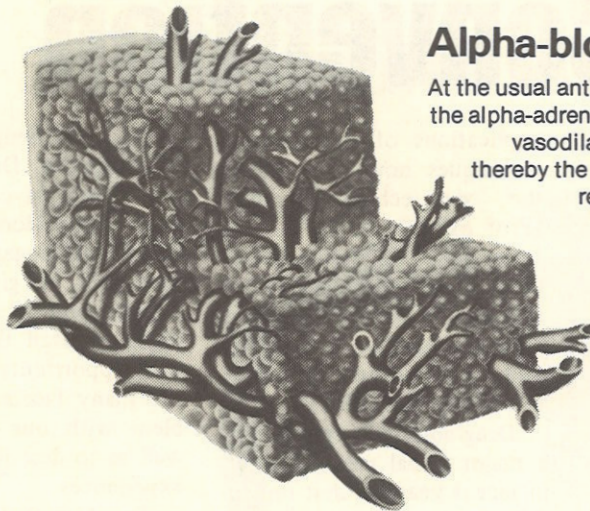
The Symposia will be held in the Stamford Room, adjacent to the Exhibition area.

Of particular interest is the one on medical aspects of drug abuse. The majority of doctors are probably not interested in treating drug addicts and wish they would go to someone else's clinic; but the problem is there and so we should brush up and keep up-to-date on treatment aspects. Is this a drug withdrawal? Is this due to overdose? Is it necessary to send this case to hospital? Is it safe to send him home? Since 1978 we have had to be on our guard against barbiturate abuse, and the hazards of this will be discussed.

Drug abuse and addiction presents not only medical problems but also social ones. It is an area where politicians, lawmen, social workers and doctors need to work together. This is reflected in the composition of the speakers in our Symposium on social aspects of drug abuse. The speakers have been asked to brief us on the current situation, and we can expect a concise up-to-date assessment of the drug situation in Singapore from Mr Tee Tua Bah. Mr Baey Lian Peck will be speaking on behalf of SANA. And we can hear how they do things in Malaysia and Hong Kong.

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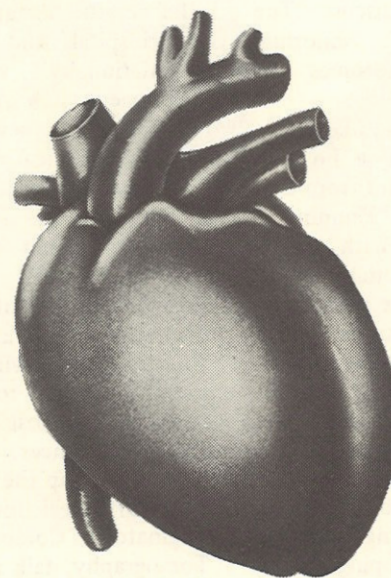
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Psychological and Psychiatric Problems in Children

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Surveys elsewhere show that between 5% and 12% of children have emotional and behaviour problems of psychiatric significance. This is about ten times the number of children who are actually referred to psychiatrists. Who gets referred to a clinic will depend on the adults' understanding of the function of a psychiatrist, their understanding of troubled children and their tolerance of the disturbed behaviour. Besides psychiatrists, parents may approach social workers, psychologists, teachers, doctors, pastors, traditional healers and family elders for help.

Consequently, there is a bias as to the types of emotional conditions seen by various agencies in the community eg. children "beyond parental control" are more likely to get referred to social agencies, school children who are underachieving to school counsellors/psychologists, those with somatic complaints to doctors and children whose symptoms have some religious themes to the clergy or temple mediums. The case-load of an agency, therefore, is selective and does not reflect the prevalence of troubled children in the community. Furthermore, when the parents do not share the same view as the referring agency that a child has an emotional problem, some of them will resist coming for a psychiatrist consultation.

There is no universally applicable definition of psychological problem or psychiatric illness in children. But this does not prevent us from understanding troubled children, assessing the presence of maladjustment or helping them.

Understanding troubled children

Children are less able to talk about what upsets them and so they tend to express their emotional problems, if any, in disturbed behaviour eg. lack of love may lead to attention-seeking behaviour, anxiety over security to clinging behaviour or aggressiveness. Therefore, disturbed behaviour is to be taken as a form of communication — a call for help — that all is not well with a child. It indicates some intolerable tension between him and his environment. Some parents may misinterpret the disturbed behaviour as madness, stupidity, laziness, wickedness, demon-possession or split personality and act accordingly to get rid of these in the child. When no improvement occurs, some

may become even more convinced in their attitude of the condition and apply even greater pressure. At this point, it is well to note that psychoses are uncommon in childhood.

Disturbed behaviour may be situationally determined so that it may be present at home but not in school or vice versa. An interesting example is elective mutism where a child talks normally at home but will not say a word in school.

A population survey elsewhere shows that neuroses and conduct disorders (antisocial behaviour problems) form about 90% of the psychological and psychiatric problems in children aged 10 and 11 years. Of course, this figure cannot be assumed to apply to other age groups and to our local situation.

The presenting symptoms of neuroses may be some of the following: marked nervousness, persistent fears, school refusal, restlessness, aggressiveness, passivity, sleep disturbance, appetite upset, aches and pains, vomiting, over-breathing, tics, frequent crying, in addition to the more typical features of phobia, obsessive-compulsive symptoms, hysterical symptoms and depression.

Some parents are very puzzled by the general non-specific features present with a neurosis. They may report that the child is disorganized in his play or can't fit into the family routine. His effort is unproductive so that he is under-achieving or is falling in his examinations. He tends to be selfish. He can't share his toys with others and won't let his sibs touch his things. He takes offence easily when none is intended so that he becomes quarrelsome or hostile. He misinterprets others' action and this may result in his feeling jealous, unloved or neglected. He is driven by idealized striving and thus becomes over-meticulous. Only 100 marks, the best or the most expensive will ever satisfy him. At other times, he is over-dependent and wants to be fed and dressed. He then appears to be very clinging, demanding and attention-seeking. Parents may complain that he is stubborn and has difficulty adjusting to any change of family routine. He tires easily and appears lazy, slow and inattentive. He finds no joy in his toys or play and nothing seems to please him. He gets fed-up with his toys easily and expects new ones frequently.

Conduct disorders are characterised by antisocial behaviour and are diagnosed when the behaviour is persistent and disturbing to those in the environment. The cluster of symptoms consists of some of the following: stealing, lying, foul language, disobedience, destructiveness, aggressiveness, truancy from school, staying out late, running away from home, fire-setting, fixed sexual perversions and delinquent behaviour. Conduct disorders are more common in boys than girls.

Reading retardation is commonly found in children with conduct disorders. It has been said that some of those children would rather be known as trouble-makers than as slow learners.

Parents like to know the cause of their child's problem. Usually, multiple factors contribute to the manifestation

of symptoms. These may be grouped under:

i) **Biological factors:** these are the results of heredity, or the influence of harmful factors before, during or after birth leading to physical or mental handicaps.

ii) **Psychological factors:** like marital discords, neurotic family, child abuse, rejection, neglect, hospitalization, bereavement, traumatic events.

iii) **Social factors** like unemployment, poverty, poor housing, cultural deprivation, malnutrition, illegitimacy, broken homes leading to repeated fostering or institutionalization of the child.

Children living under these circumstances are at risk of maladjustment.

Assessment:

The process of growing up has its ups and downs. Studies have shown that most

children have isolated emotional problems at one time or another. They may have transient periods of emotional disturbance or behaviour problems which are part and parcel of growing up and are not in themselves a cause for concern eg. transient fears, temper tantrums, tics.

There are some criteria to help us assess whether a child's problem is of psychiatric significance. They are:

1) **The age of the child.** Is the behaviour appropriate for the age of the child? Some behaviours are normal at 1 year old but not so at another eg. bedwetting. Temper tantrums are quite common in a 4-year old, getting less common with age so that at 11 frequent temper tantrums are

(Continued on Page 5)



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MEDICAL MANDARIN

D: Good Morning, Mr Tan, please sit down.

P: Doctor, I have difficulty walking. I seem to be weak on my left side.

医生: 早安, 陈先生, 请坐。

zhǎo ān, chén xiān sēn, qǐng zuò

病人: 医生, 我走路有点困难, 我觉得我的左边比较虚弱。

yǐ sēn wǒ zǒu lù yǒu diǎn kùn nán, wǒ què dé wǒ de zuǒ biān bǐ jiǎo xū ruò

D: How did you notice it?

P: I noticed it this morning when I woke up.

医生: 怎样发觉的呢?

zēn yàng fā què dé nē

病人: 我今早起身后, 注意到。

wǒ jīn zhǎo qǐ sēng hòu, zù yì dòu

D: Has the weakness increased since then?

P: No, I feel that it has remained the same.

医生: 你的虚弱, 从你发觉到现在, 有没有增加?

nǐ dé xū ruò, zóng nǐ fā zué dòu xiān zài, yǒu méi yǒu zēn jiā

病人: 没有, 我一直觉得都是一样。

Méi yǒu, wǒ yì zhí zué dé dōu sè yì yāng

D: Is there any numbness as well?

P: Yes, especially my left hand.

医生: 有没有感觉到麻痺呢?

yǒu méi yǒu gǎn zué dòu mǎ bì nē

病人: 有, 特别在我的左手。

yǒu, tè bié zài wǒ de zuǒ shǒu

D: Do you have any difficulty with your speech or your vision?

P: Yes. My speech is slurred and I have been seeing double as well.

医生: 你在讲话方面或视觉方面, 有没有困难?

nǐ zài qiǎng huà fāng miàn huò shì zué fāng miàn, yǒu méi yǒu kùn nán

病人: 有, 我在讲话方面不太清楚, 在看方面看到双重的影子。

yǒu, wǒ zài qiǎng huà fāng miàn bù tài qīng chǔ, zài kàn fāng miàn kàn dòu xuāng zhòng de yǐng zǐ.

D: Do you have any difficulty eating or drinking?

P: When I drink too fast the water comes out through my nose.

医生: 你在饮食方面, 有没有困难?

nǐ zài yǐn sī fāng miàn, yǒu méi yǒu kùn nán

病人: 当我喝水, 喝的太快时, 水就会从我的鼻孔流出来。

dān wǒ hē suǐ, hé dé tài kuài shí, suǐ jiù huì chōng wǒ de bí kǒng liú chū lái

D: Do you have any headache?

P: No.

医生: 你有没有头疼?

nǐ yǒu méi yǒu tóu tòng

病人: 没有。

méi yǒu

D: Did you have similar complaints before?

P: Yes, doctor. About two months ago I felt giddy and had numbness and weakness on my right side.

医生: 你以前有没有发生过同样的情形?

nǐ yǐ qián yǒu méi yǒu fā sēn guò tóng yàng de qīng xīng

病人: 有, 医生, 在两个月前, 我感到头晕, 我有感觉到我的右边麻痺及无力。

Yǒu, yǐ sēn, zài liǎng gè yuè qián. Wǒ gǎn dòu tóu yūn wǒ yǒu gǎn jué dòu wǒ de yòu biān mǎ bì jí wú lì.

D: Could you please clarify what it was like when you were giddy?

P: Oh I felt the whole room spinning.

医生: 请你更清楚的告诉我, 当时头晕的情况?

qīng nǐ gēn qīng chǔ de gào sù wǒ, dāng shí tóu yūn de qīng kuàng

病人: 啊! 我觉得整个房间在旋转。

ah wǒ què dé zēn gē fāng jiān zài zhú zhuān

D: How long did it all last?

P: A few minutes

医生: 这种情形, 维持多久?

zèr zhǒng qíng xíng, wéi qí duō jiǔ

病人: 几分钟。

jǐ fēn zhōng

D: Do you have any other illness such as hypertension?

P: Yes my blood pressure is high and I am a diabetic.

医生: 你有没有其他的病症, 例如: 高血压?

nǐ yǒu méi yǒu qí tā de bìn zhēn, lì lú: gāo xuè yā.

病人: 有, 我有高血压及糖尿病。

Yǒu, wǒ yǒu gāo xuè yā, jí táng niào bīn

D: (after examining patient) Mr Tan you have a stroke resulting in weakness and numbness of the left side of your body as well as difficulty in swallowing and blurring of vision

医生: (检查过后) 陈先生, 你是中风过后的后遗症, 所以你会感觉到你左身麻痺及虚弱, 饮食困难及视觉模糊。

jiàn chá guò hòu chén xiān sēn nǐ shì zhōng fēng guò hòu de hòu yú zhèn suǒ yǐ nǐ huì gǎn zué dòu nǐ zuǒ shēn mǎ bì jí xū ruò, yǐn shì kùn nán jǐ sī zué mō hú

P: What is the cause doctor?

病人: 医生, 是什么原因造成这种病症?

Yǐ sēn, shì shén me yuán yīn zhōu chén zē zhǒng bìn zhēn

D: In your case it is probably due to narrowing of blood vessels.

This causes poor circulation to certain areas of the brain.

医生: 以你的情况来看, 多是血管狭窄, 这会导致血

液循环的不顺利及部份的脑受到伤害。

yǐ nǐ de qīng kuàng lái kàn, duō shì xuè guǎn xiǎ zǎi, zèr huì dǒu jì xuè

yǐ duàn huán dé bù sùn lì jì bù fēn dé nǎo sǒu dǒu shān hài

P: Is it serious?

病人: 这严重吗?

zèr yēn zhòng mā

D: It is serious. However if we take care of your diabetes and control your blood pressure we may be able to prevent further deterioration. You should be admitted to the Department of Neurology for observation in case there is any deterioration for which specialised treatment may be necessary.

医生: 严重, 不过, 如果我们能控制你的糖尿病及高血压, 你的病情就不会恶劣下去。你应该进入高级神经专科部门受检查, 如果病情恶化, 可能需要特别的治疗。

yán zhòng, bù guò wǒ men néng kòng zhì nǐ de táng niào bīn jí gāo xuè yā yǐ dé bìn qīng jiù bù huì èr lüè xià qù nǐ yīng gāi jìn lù gāo jí jīng xīng chuān gé bù mén sù jiàn chá lù guā bìn qīng er huà, kě néng xū yào tè bié de zhì liáo

P: Thank you doctor.

病人: 谢谢你, 医生。

xià xià nǐ, yǐ sēn

PSYCHOLOGICAL AND PSYCHIATRIC PROBLEMS IN CHILDREN

(Continued from Page 3)

more likely to indicate some emotional problem.

2) The **intelligence** of the child. Age alone is not enough for assessing the significance of disturbed behaviour. Intelligence has to be taken into consideration.

3) The **intensity** and **persistence** of a particular behaviour ie. how disturbing and for how long? Many children have fears. Emotional problem may be suspected when a child is so full of fears that no sooner does one disappear than another takes its place. Many children bite their nails at some time or other. However, few do it to the extent of bleeding. Such a degree of intensity would indicate emotional problem rather than just a habit.

4) The **extent** of the disturbance — how many? Generally, multiple behaviour problems would indicate maladjustment.

5) The child's **family background**. A child with delinquent behaviour and who comes from a high delinquency area and from a family with a criminal record is likely to be following the family pattern.

6) Besides judging the behaviour in terms of its abnormality, it is necessary to note whether the behaviour or symptom is affecting the child's day-to-day living:

- i) whether it is causing him to suffer eg. being tearful, fearful, having frequent nightmares, being often worried.
- ii) whether it interferes with his development and daily activities eg. regressive behaviour, learning failure, weight loss, being inattentive or forgetful, not wanting to brush his teeth, to change his clothes or to bathe.
- iii) whether it disturbs his relationship with other people eg. he is not liked by others, is picked on, bullied or teased; is withdrawn, solitary, hostile, rebellious, jealous or revengeful.

Treatment:

Although all children in the course of growing up meet with stresses and strains and at some time react to these with temporary behaviour problems, there are a group of children with psychological or psychiatric problems who need skilled help.

They need careful assessment and skilled help because they are suffering, their development is not moving forward and because they are not enjoying harmonious human relationships.

It is well to note that when a child's problem per-

sists without change for the better, the parents are often found to have some difficulties of their own that prevent them from reacting to their child in a more helpful manner. Therefore, when a child has behaviour and emotional problems, the family must be considered and if necessary, helped.

Conditions that may get referred to a child psychiatric clinic include the following:

1) Children with adaptation reactions. Here the child's behaviour or upset is a transient reaction to current situational stress, the relief of which results in the disappearance of the symptoms. For example.

a) a child who is unable to relate with his parents in a mutually satisfying way after prolonged separation.

b) a child who persistently refuses to leave home for school.

c) a child who is emotionally upset long after the loss of a parent by bereavement, separation or divorce.

2) The child who attempts or threatens suicide or who appears depressed.

3) The child who shows phobic, obsessional or hysterical symptoms of long duration and which persist even when the identifiable environmental causes have been modified or removed. The child who is abnormally

anxious.

4) Children with conduct disorders.

5) Children suffering from asthma with a major psychological component.

6) Children with development disorders which are associated with a significant secondary emotional component. Those who are under-achieving in school because of unresolved emotional problems.

7) The difficult epileptic child whose behaviour problem is intolerable to the family or the school. Other children with organic brain syndromes accompanied by emotional and behaviour problems.

8) The child who appears to be autistic or psychotic.

9) The child with eating disorders eg anorexia nervosa.

10) Physically and mentally handicapped children with emotional and behaviour problems which the family find difficult to cope with.

11) The child with elective mutism or troublesome tics.

The management of children with emotional and behaviour problems involves not only the effort of the professional staff in the clinic but also the cooperation of the parents and other adults who are responsible for the care of the children.

AIROL Roche

The problems of puberty are intensified by acne.

«Ainol» treatment helps solve the external problem directly and the internal problem indirectly.



Ainol = Trade Mark

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A revolution in the treatment of diarrhoea in infants



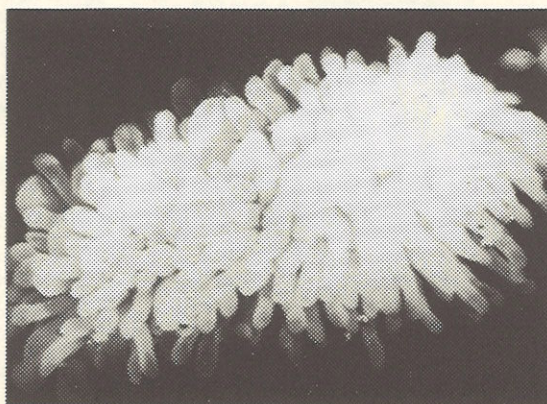
Until now the treatment of diarrhoea in infants has been mainly symptomatic: prescription of antibiotics to combat the infectious causal organism, or absorbent powders, in cases of non-infectious diarrhoea. However refeeding, which should aim at restoring the strength of a child weakened by the bout of diarrhoea, has been somewhat neglected.

As clinical experience had shown that milk was poorly tolerated, dietary measures were confined merely to putting the child on a starvation diet

for a varying length of time and then gradually introducing milk again, slowly and very carefully.

However recent studies in the field of infantile gastroenterology

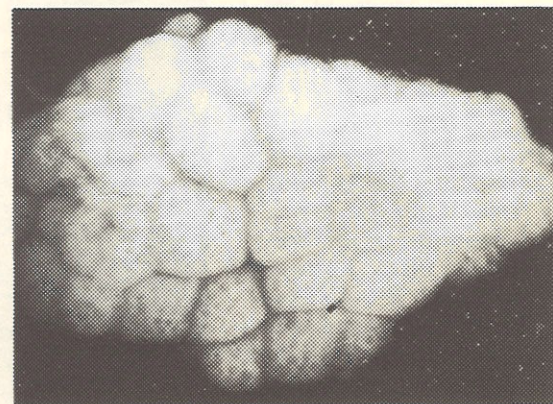
have made it possible to understand the reasons for this intolerance to milk and have opened up fresh vistas in the treatment of diarrhoea in infants.



Normal Intestinal Mucosa

It has been shown that the intestinal mucosa is damaged to a varying extent in acute infectious diarrhoea and chronic disorders of the small intestine (coeliac disease for example).

Disaccharidases, enzymes which hydrolyse dietary disaccharides, are localized in the



Severe Atrophy

external membrane of the microvilli. When there is a disorder of the small intestine, such as infectious diarrhoea, the microvilli of the brush border are the first to be affected and there results a secondary deficiency of disaccharidase activity.

al110[®] Nestlé[®]

— a disaccharide free formula — provides complete nutritional support during the time of diarrhoea.

Containing only glucose — this sugar is absorbed directly without enzymatic action.



Changing Patterns of Paediatric Diseases in Singapore

The pattern of paediatric diseases in Singapore has changed since the Department of Paediatrics of the University of Singapore was first set up in 1962. It is the purpose to describe and discuss the factors which have led to this pattern change, and the steps which have been taken to tackle these new patterns.

Singapore is an Island Republic with an area of 587.6 square kilometres, and the population in 1974 was 2,219,100 comprising Chinese (76%), Malays (15%) and Indians (7%), with other ethnic groups representing the remaining 2%. Although Singapore is small, it ranks as one of the most densely populated countries of the world, the overall population density being 3,787 persons per square kilometre.

Health Situation in 1962

For purposes of comparison, 1962 is taken as the base year coinciding with the establishment of the Paediatrics Department. The relevant Health Statistics in 1962 were as follows (Table I): It can be seen that compared to Japan, Denmark, U.S.A., Australia and New Zealand, Singapore had the highest infant mortality rate (IMR).

A breakup of the deaths during infancy of those dying within 24 hours, 1-6 days, 7-27 days, and 28 days to 1 year respectively, is seen in the following table (Table II):

Age	No.	%
Less than 1 day	238	12.9
1-6 days	615	33.4
7-27 days	274	14.8
28 days-1 year	716	38.9

Post-neonatal deaths comprise a large number of the infant deaths, 39% being in this age group.

Relating some of the early infant deaths to *per 1000 live-births* gives the following figures (Table III):

Stillbirths	12.7
Deaths less than 1 week of age	14.5
Perinatal deaths	27.0
Deaths 7-27 days	4.6
Post-neonatal deaths	12.1

These figures for Singapore in 1962 have been calculated for comparison with other countries as suggested by Shapiro (1976) in WHO World Health Statistics Report.

To get an idea of the contribution of certain diseases to paediatric deaths in Singapore in 1962, 6 categories were analysed, and they are as follows (Table IV):

Cause of Death	%
BIRTH INJURY (as % of all deaths in neonatal period)	20
IMMATURITY (as % of all deaths in neonatal period)	40
PNEUMONIA AND DIARRHOEA (dying at 0-4 yr. as % of all deaths occurring 0-4 yr. of age)	31
CONGENITAL MALFORMATIONS (dying during first year of life as % of all infant deaths)	7
MALIGNANCY (dying at 0-14 yr. as % of all deaths occurring 0-14 yr.)	1.9
ACCIDENTS (dying at 0-14 yr. as % of all deaths occurring 0-14 yr.)	5.9

As with all death statistics in any country, its usefulness depends on the accuracy of certification of the cause of death. In 1962, death certification was carried out by the following (Table V):

By qualified doctors	58.6% (70%)
By coroner	15.8% (20%)
By hospital assistants	20.7% (10%)
By police officers	4.9% (0%)

* Figures for (1974).

All the above figures refer to Singapore as a whole (Report on Births and Deaths, Singapore, 1962), and the accuracy of such national figures can be assessed by comparing them to the mortality figures in the Department of Paediatrics (Ang *et al.*, 1974). Here, the 1964 figures are used instead of the 1962 or 1963 because the Department started functioning fully only from 1964. The relevant figures are as follows (Table VI):

The Department admits patients up to 12 years of age. It is seen that pneumonia was the commonest cause of death accounting for 23% of

	No.	%
Total No. of Admissions	6,249	
Total Deaths	280	4.5
Pneumonia deaths	63	23
Congenital heart disease deaths	44	16
Kernicterus deaths	28	10
Diarrhoea deaths	23	8
Meningitis deaths	7	3
Leukaemia deaths	3	1

all deaths, while congenital heart disease (CHD) was next with 16%, followed by kernicterus with 10%; but if first week deaths only are considered, kernicterus was the commonest cause of death, accounting for 66% of all first week deaths; and it was

still the commonest cause of death up to one month of age accounting for 30% of all neonatal deaths in the Department (Wong, 1964; 1966; 1972; 1975). Diarrhoea accounted for only 8%, meningitis 3% and leukaemia only 1% of all deaths. All other single causes were less than 1% by itself.

The conclusion which could be drawn was that in 1962 the infant mortality rate was high, and that it was highest during the first week of life, and that post-neonatal deaths were also considerable, comprising 39% of all infant deaths. Regarding individual causes, immaturity and birth injury were large contributors to death. Kernicterus was also a sizeable problem as pointed out by Wong (1957). The infections especially pneumonia, caused large numbers of deaths. Even as early as 1962, congenital malformations were becoming important, and indeed CHD was the second commonest

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cause of death in the Department. Deaths due to malignancy were relatively unimportant at that time, but accidents accounted for 6% of all paediatric deaths in Singapore.

Policy of Department of Paediatrics

With the above profiles as a basis, plans were formulated to improve child health in Singapore, and to reduce paediatric morbidity and mortality. The following were actively pursued:—

(a) Undergraduate Paediatric Education

There was little emphasis on paediatric teaching in the medical school, which is patterned on the British System, and all former British colonies had this grave problem, e.g. India, Sri Lanka, Hong Kong and Malaysia. Since the majority of graduates would go into private practice, expertise to deal with childhood illness was minimal, and this was even less in the case of infants.

After several years of uphill fighting in the Faculty of Medicine (a common phenomenon in all British-type medical schools), undergraduates now spend 12 weeks in a paediatric posting in the penultimate year of a 5 year course, and another 6 weeks in the final 5th year. This amount of clinical posting is now second only to internal medicine, and exceeds both surgery and obstetrics/gynaecology. In the final professional examination, paediatrics is examined together with internal medicine on a nearly equal basis. Because of this, recent graduates have a better knowledge of paediatrics.

(b) Postgraduate Paediatric Education

In 1962, there were only 6 qualified paediatricians in Singapore, as, again being a British colonial type of medical school, paediatricians can only qualify after going to Britain and passing the M.R.C.P. Examination.

However, since 1970, the Postgraduate School of the University of Singapore, introduced post-graduate training and certification in Paediatrics, the Master of Medicine (Paediatrics), which is equivalent to the M.R.C.P. and M.R.A.C.P. and the American Board Diploma in Paediatrics. This training and

certification, has now produced about 40 qualified paediatricians in Singapore.

(c) Neonatology

Most of the deaths involved babies in the perinatal and neonatal periods.

The department established a Neonatal Division in the largest obstetric hospital in Singapore — the Kandang Kerbau Hospital — and over the years managed to obtain two full-time University-paid paediatricians assisted by two full-time medical officers to concentrate on neonatology.

(d) Kernicterus Project

The Department established the fact that erythrocytic G6PD deficiency was responsible for about 1/2 of all cases of kernicterus deaths in Singapore.

A surveillance system was set up in all Maternity Hospitals (Wong, 1966), and a rapid cord blood screening method was used to screen all newborns; and those with G6PD deficiency were detained in hospital for three weeks to prevent coming into contact with haemolytic triggers such as Western drugs, Chinese and Malay herbs and moth-balled clothes. Families at risk of kernicterus due to other causes were also identified by a strict system of history-taking. This surveillance system includes the MCH clinics as well as education of laymen through the mass media. Exchange transfusions were introduced, and later solar and phototherapy (Wong, 1975).

(e) Malnutrition

It was evident that many of the neonatal and infant morbidity and mortality were due to poor nutrition. Because obvious kwashiorkor and gross avitaminosis were rare in Singapore, it was assumed by many that malnutrition in infants and children did not exist in Singapore. Death certification of babies as being due to pneumonia or other infections did not take malnutrition into consideration as a cause of death. Wong (1974) showed in 1971 that in a consecutive series of infants and children admitted to the Department with acute infection, about 20% were below the malnutrition weight level (Table VII).

For the first time, it was accepted that many babies and children in Singapore were not getting enough to eat. Sung and Pakshong (1973) later confirmed this in a random survey on babies and children in one part of Singapore comprising non-

TABLE I

	Singapore	Japan	Denmark	U.S.A.	Australia	N.Z.
Population	1,755,100					
No. of live births	58,977					
Birth rate/1000 population	34.0					
No. of deaths	10,178					
Death rate/1000 population	5.9					
Natural increase (%)	2.8					
No. infant deaths	1,843					
Infant mortality rate/1000 L.B.	31.2	26.4	20.1	27.6	20.4	20.4
No. deaths 1-4 yr.	2,394					
Death rate 1-4 yr./1000 population	1.4					
No. maternal deaths	23					
Maternal mortality rate/1000 S.B. and L.B.	0.4					
Perinatal mortality rate	26.7					
Neonatal mortality rate	19.1					
Stillbirths	740					
Stillbirth rate	12.4					

(Continued on Page 8)

Changing Patterns of Paediatric Diseases in Singapore

(Continued from Page 7)

TABLE VII
N=1151

Age	No. Underweight	Total	% Underweight
0-6 months	82	323	25.5
6 months-1 year	36	157	23
1 year-4 years	59	379	15.6
4 years-7 years	26	171	10.2
7 years-10 years	19	121	15
Total	223	1,151	19

hospitalised patients, where depending on the age groups, 10-20% were suffering from malnutrition. Wong (1970) also showed that nutritional anaemia was extremely common in Singapore babies and children, comprising both iron deficiency and folate deficiency.

Arising from all this, the Ministry of Health invited a WHO nutritional expert to survey the problem. This expert confirmed the above findings (Selenus, 1973), and the Government set up a Paediatric Nutrition Unit in 1970 to deal with the problem.

(f) Breast-Feeding

Wong (1961; 1963; 1971) had monitored the rapid deterioration in the breast feeding status among rich and poor mothers in Singapore, so that by 1971, 28% of well-to-do families initiated breast-feeding and 4% were still breast-feeding by three months; while among the poor, 51% initiated, and 5% were still breast-feeding by three months. This probably represents the worst breast-feeding status anywhere in the world (Vahlquist, 1976). The great disadvantage of artificial feeding was seen among the poor, who are unable to mix cows milk powder in the correct proportions to ensure sufficient calories, etc., on the one hand, and unable to prevent excess solute load to the kidneys on the other. Poor hygiene in preparation of artificial feeds predisposes to infection, and finally, fashion and advertising deprive these families of much needed money to spend on food for the other children.

A nation-wide campaign was started by the Department to increase breast-feeding, and a strong Breast-Feeding Mother's group has been established. More mothers are breast-feeding now, and three breast milk banks have been started to obtain human milk for babies allergic to cows milk.

(g) Family Planning

In 1962, there were almost 60,000 live births with a birth rate of 34 per 1000 of the population, the natural increase being 2.8%. The age-specific fertility rate per thousand of the female population was as follows (Table VIII):

Very young mothers and elderly mothers giving birth in such large numbers constitute poor obstetric risks, and also constitute poor mothering either because of inexperience or because of having too many children. Whichever way, this tends to favour paediatric morbidity and mortality.

TABLE VIII

Female Age Group	Age Specific Fertility Rate
15-19 Years	54
20-24	246
25-29	291
30-34	231
35-39	156
40-44	66
45-49	9

The Department had been teaching medical students, nurses, health workers and mothers on the desirability of limiting births in this regard. This was given a great impetus when in 1966, 12th January, the Singapore Family Planning and Population Board was established by an Act of Parliament, and Family Planning became the official policy of the Government.

Contraceptive advice, supply of contraceptives, abortions, sterilisations and disincentives for producing more children were introduced. These activities were directed towards the laymen as well as towards medical and paramedical personnel.

(h) Genetic Counselling

It was realised by the Department that all diseases have a certain genetic load and a corresponding environmental weightage. The mendelian and chromosome diseases are totally genetic, but they form at most only about 10% of all paediatric diseases. However, it is the multifactorial polygenic diseases (Wong, 1972b) which form the 90% or more of all diseases, at all ages.

A human genetics division was set up in the Department since its inception in 1962, and genetic counselling has been offered in relevant cases. Prevention of further mendelian diseases and inherited chromosome diseases are achieved by advice as well as prenatal diagnosis with studies on amniotic fluid, and cells when relevant. Counselling is offered in all instances of multifactorial diseases to prevent the onset of disease manifestation in, not only the propositus, but also his siblings and parents. The Department considers the hospital as a base for health delivery to the whole family. The didactic paediatric lectures to undergraduates during the whole of the fourth year consist only of genetics and development. Practical aspects of paediatrics are taught only when they are posted to the wards.

(i) Immunisations

Immunisation of certain specific infectious diseases have been offered in Singapore free of charge even prior to 1962. When Singapore was a British colony, vaccination against smallpox and diphtheria were offered as early as

1923 to babies free of charge. Gradually, BCG inoculation, inoculation against tetanus and whooping cough, and later polio vaccine were also offered free. Up to 1962, only vaccination against smallpox was compulsory by law, and no smallpox outbreaks had occurred for years. Yet in 1959, there were 37 deaths from tuberculosis up to age 14 years and 32 deaths from diphtheria. Obviously, in spite of giving these prophylactic agents free, cultural attitudes and ignorance prevented a higher acceptance rate.

In 1962, the Government passed an Act making diphtheria inoculation compulsory, without which, a child cannot later be accepted into primary school. Parents now bring their babies for diphtheria inoculation, and with it, tetanus and whooping cough prophylaxis are given together with oral Sabin.

Present Paediatric Health Situation

The Health Statistics in 1975 reveal that there have been considerable improvements since 1962.

1. The infant mortality rate has dropped from

191.3 in 1931 to 31.2 in 1962, and down to 13.9 in 1975 (Figs. 1a and 1b).

2. The perinatal mortality rate has dropped from 26.2 in 1962 to 16.6 in 1975 (Fig. 2).
3. The neonatal mortality rate has fallen from 19.1 in 1962 to 10.2 in 1975 (Fig. 3).
4. Analysis of the fall in infant mortality rate shows that the reduction has been achieved as much in the post-neonatal period as during the neonatal period (Fig. 4).

The improvement in infant nutrition probably has a great part to play in this regard.

It is useful to compare certain aspects of infant deaths in Singapore in 1975 with those in Japan, Australia, Denmark, New Zealand and the United States of America, the latter statistics being the latest available to WHO (Shapiro, 1976). (Table IX)

It is seen that countries with low IMR have reduced post-neonatal deaths to 1/3 of the total. However, it is possible to reduce this further. But the first day mortality varies from 30% to 40%, and the first week mortality verges on 2/3 of the whole. It is this group which needs close scrutiny if IMR is to be reduced still further. Deaths from 7-27 days are the lowest. Compared to 1962, there has been an obvious reduction in the post-neonatal death rate. The death rates per 1000 live births for various periods of infancy in 1962 are compared with those for 1974 (Table X):

TABLE X
DEATH RATES PER 1,000 LIVE BIRTHS

	1962	1974	Fall
Stillbirths	12.7	8.3	34.7%
Perinatal Deaths	27.0	18.2	32.6%
Deaths less than 1 week	14.5	9.9	31.7%
Deaths 7-27 days	4.6	2.1	54.3%
Post-Neonatal deaths	12.1	4.7	61.1%

There have been falls of more than 50% in the 7-27 days group and the post-neonatal group.

(b) Distribution of Paediatric Deaths by Age

TABLE IX

	Singapore	Japan	Denmark	Australia	N.Z.	U.S.A.
Under 1 year (IMR)	13.9	11.7	12.2	16.7	15.6	18.5
Less than 1 day (% of total infant deaths)	29.5%	17.4%	31.3%	40.3%	31.9%	42.9%
1-6 days	29.5%	33.8%	35.4%	25.0%	24.5%	24.2%
7-27 days	12.9%	15.2%	10.5%	7.0%	7.7%	7.2%
28 days-1 year	28.1%	33.6%	22.7%	27.7%	36.0%	25.7%

INFANT DEATHS/1000 LIVE BIRTHS

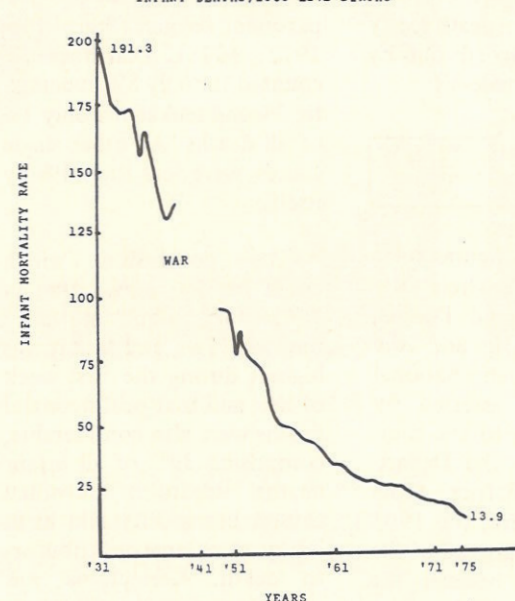


Fig. 1a. The infant mortality rate from 1931 to 1975.

INFANT DEATHS/1000 LIVE BIRTHS

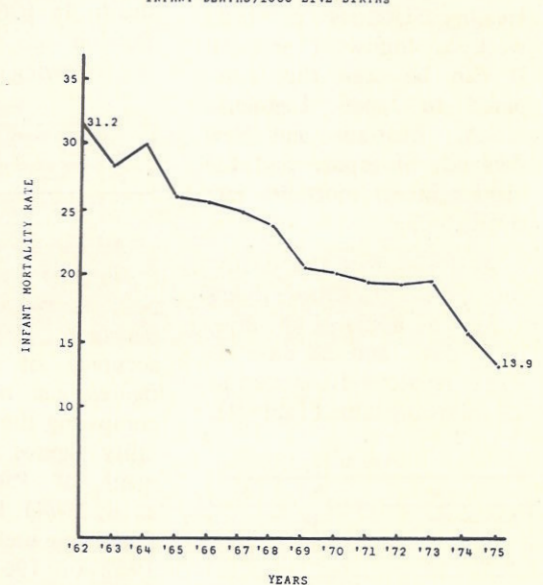


Fig. 1b. The fall of the infant mortality rate from 31.2 per 1,000 live births to 13.9 per 1,000 live births in 1975.

PERINATAL DEATHS/1000 LIVE BIRTHS

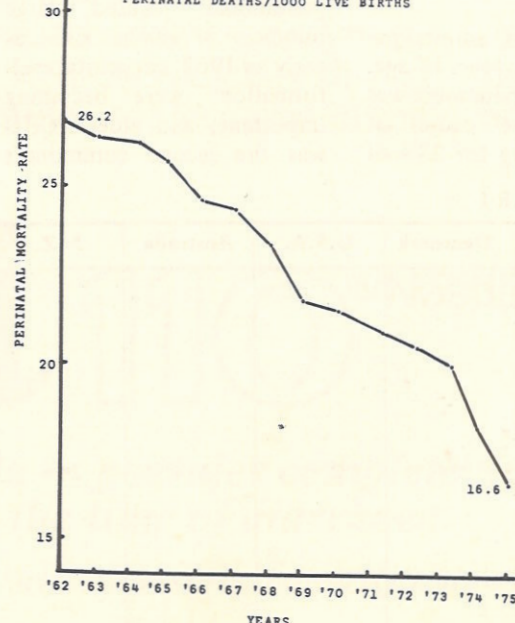


Fig. 2. Showing the fall in the perinatal mortality from 26.2 in 1962 to 16.6 in 1975.

NEONATAL DEATHS/1000 LIVE BIRTHS

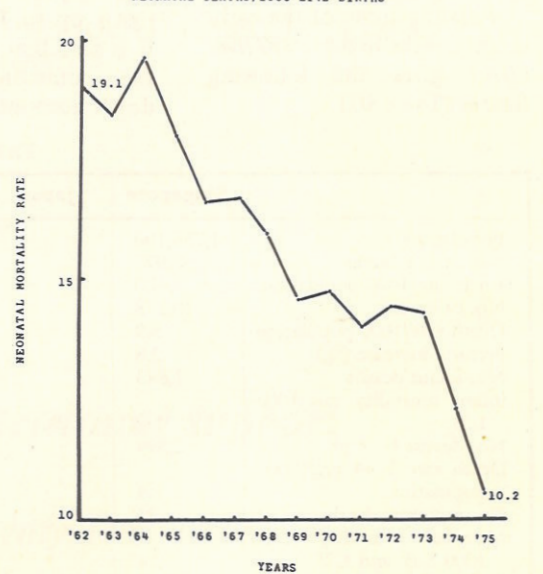


Fig. 3. Showing the fall in the neonatal mortality rate from 19.1 in 1962 to 10.2 in 1975.

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Changing Patterns of Paediatric Diseases in Singapore

(Continued from Page 8)

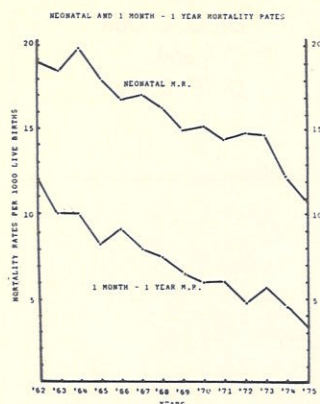


Fig. 4. The fall in the infant mortality has been achieved by comparable falls in both the neonatal mortality rate and the post-neonatal mortality rate.

The number and percentage of deaths in infancy, 1-4 years, 5-9 years and 10-14 years are compared for 1962 and 1974 (Table XI):

Paediatric Age Groups	1962		1974	
	No.	%	No.	%
Less than 1 year	1,813	79	728	63
1-4 years	310	13	193	17
5-9 years	113	5	112	10
10-14 years	66	3	115	10

Proportionally, there is a fall in deaths in the infancy age group with corresponding rises in the older age groups. (c) *Distribution of Deaths by Some Causes*

For the whole of Singapore, the proportion of deaths from immaturity, birth injury, congenital malformations, pneumonia and diarrhoea, accidents and malignancy are compared. As can be seen in Fig. 5, there has been more than double proportional rises in deaths due to congenital malformations and malignancy, one quarter rise in deaths due to accidents, and one-fifth fall in deaths due to pneumonia and diarrhoea. There has been little proportional changes in deaths due to birth injury and immaturity.

More specifically, the changes between 1964 and 1975 in deaths due to the 6 commonest causes in the Department of Paediatrics are shown in Fig. 6. Pneumonia heads the list, followed by congenital heart disease. Deaths from kernicterus or mental retardation due to kernicterus are almost non-existent. The rele-

SOME CAUSES - DEATHS
COMPARISON 1962/1974

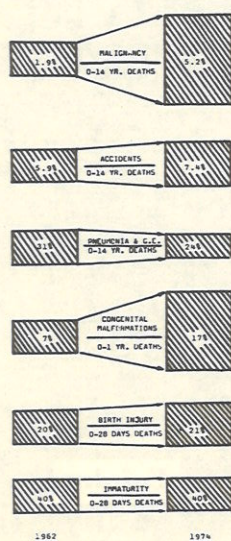


Fig. 5. Showing the reduction in deaths due to infections, but there has been a relative increase in deaths due to malignancy, accidents and congenital malformations.

vant figures for 1964 and 1975 are as follows (Table XII):

	1964		1975	
	No.	%	No.	%
Death rate/100 Admissions		4.5		2.6
Pneumonia	63	23	12	14
CHD	44	16	6	7
Gastroenteritis	23	8	3	4
Kernicterus	28	10	1	1
Meningitis	7	3	1	1
Leukaemia	3	1	4	5

(d) Population

Because of vigorous efforts in Family Planning the total live births in 1962 of 58,977 was brought down to 39,948 in 1975, in spite of an increase in the female population in the reproductive age group. The age-specific fertility rates per 1000 female population are compared in the following Table XIII (Annual Report of Singapore FP and PB):

The average number of children a woman would bear in 1966 was about 5, and this fell to 2.1 in 1975. The most vulnerable maternal age groups as far as infant morbidity and mortality are concerned are the 15-19 years, and those over 35. There has been a fall in all age groups, especially a 70% fall in 15-19 years, 77% fall in the 35-39 years group and a 85% fall in 45-49 years age group. There is no doubt that successful family planning can improve the health of a population.

TABLE XIII

Female Age Groups	1966	1975
15-19 years	54	17.0
20-24	246	104.1
25-29	291	157.2
30-34	231	95.5
35-39	156	35.8
40-44	66	10.0
45-49	9	1.1

(e) Immunisations

The introduction of compulsory diphtheria inoculation, and hence the increase in acceptance rates not only for diphtheria immunisation but also for whooping cough, tetanus and oral polio vaccination, has contributed to the fall in morbidity and mortality of specific childhood infections. Taking only tuberculosis and diphtheria as examples, the number of deaths from these two infections for 0-14 years of age are compared for 1959 and 1974 (Table XIV):

TABLE XIV

	No. Deaths	
	1959	1974
Tuberculosis	37	4
Diphtheria	32	0

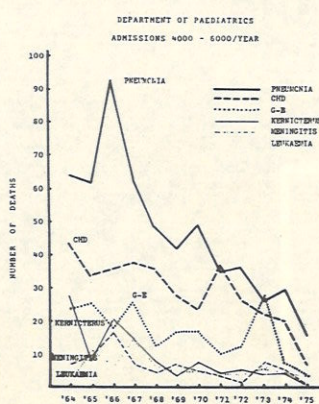


Fig. 6. Note the decrease in deaths due to infections, kernicterus and congenital heart disease in the Department of Paediatrics from 1964 to 1975.

The Future

It has been an exciting experience for paediatricians to see such changes within a short period of 12 years in a country. In terms of the infant and neonatal mortality rates, Singapore's figures are among the lowest in the world. The medical fraternity has often claimed that the poor health of a country is due to the lack of doctors, and the lack of money allotted to health care, the lack of "special" units and super-specialists, and the lack of esoteric health facilities. The following figures from the Fifth Report on the World Health Situations by WHO (1975) are illuminating. (See Table XV)

The most important factors are what type of doctors are produced, what doctors do, what the health budget is spent on and where doctors are congregated.

Therefore, where Singapore is concerned, it is obvious that the infant mortality rate can be further reduced as other countries have shown. The Department of Paediatrics have put into operation certain plans which were conceived for that purpose.

(a) Paediatric Units

With the training and certification locally of paediatricians, some of these post-graduates have gone into private practice, which is good, as this tends to raise the standard of paediatric care in the private sector. However, there are sufficient paediatricians now in the institutional sector to warrant the setting up of three new paediatric units in the smaller district hospitals in Singapore, in two of which neonatal divisions have been established. Prior to 1970, there were only two paediatric units in Singapore, now there are 5. This expansion is also possible because the local Nursing School had been running a Post-Basic Course in Paediatric Nursing for several years. It is hoped that with the increase in Paediatric Centres, more intensive therapeutic as well as preventive and health education measures can be carried out.

(b) Genetic Counselling

A concerted effort has been made to carry out ACTIVE genetic counselling

(Wong, 1972b). Doctors and laymen are made aware of the facilities available in the Department of Paediatrics, so that cases and families are referred more often now. The Ministry of Health has also assisted in this by adopting this as an official ministry policy.

(c) Family Planning

The net reproductive rate, i.e. the average number of female children, that would replace one woman, by 1975 had reached 0.978, i.e. Singapore has now reached 1 to 1 female replacement levels; and hence, the average number of children in a family is now 2. In 1975, 9,495 sterilisations in women were carried out with 453 vasectomies, and 11,890 abortions were done. 54% of women in the reproductive age group are on the pill, and 10% use the condom. It is hoped that these efforts will be increased, and by the year 2030, it is hoped that the number of live births will equal the number of deaths, i.e. ZERO POPULATION GROWTH will be attained. By that time, Singapore's population will increase from 2¼ now to stabilise at 3½ million.

(d) Breast-Feeding

The number of breast-feeding mothers is slowly increasing with the assistance of the Breast-Feeding Mother's Group, and it is our hope that both Government and Private Firms would provide facilities where mothers can leave their infants near their place of work, and take time off to breast feed their babies, at least till 4-6 months of age. This will not only cut down morbidity and mortality rates for infections but also foster closer psychological bonds between mother and child, because in fast-urbanising populations like Singapore's, parental-child psychological relationships are deteriorating.

(e) Immunisations

A Committee was formed in 1975 by the Ministry of Health to make recommendations for the overall scheme of infant and childhood immunisations for the future. I was the Chairman of that Committee, and we recommended that besides BCG, smallpox, polio, whooping cough, tetanus and diphtheria offered free to any child, the

Government should also offer free measles vaccination to all children at 1 year of age, and rubella vaccination to all 11 year old girls. The former will cut down further deaths due to measles, pneumonia and encephalitis and the latter will prevent the high rate of congenital malformations due to rubella contracted by pregnant mothers who are non-immune to German measles.

(f) Malignancy

Leukaemia management is taking up a lot of the time of paediatricians now and for acute lymphatic leukaemia with CNS prophylaxis and more effective chemotherapy, we are getting long-term survivals for the first time. But the breakthrough will have to await identification of all predisposing factors, and then the application of the relevant preventive procedures. Brain tumours still have a bad prognosis in Singapore, but Wilm's tumour holds less terrors than before with early diagnosis and treatment. Neuroblastomas, however, are still disappointing in terms of prognosis. There is no doubt that malignancies in childhood, need more of our time in future.

(g) Accidents

Morbidity and mortality from accidents are increasing in Singapore. We are disseminating knowledge about accidents in children to laymen via the mass media, and in this regard, the Singapore Paediatric Society is very active. There is a lot of iatrogenic diseases due to drugs given to children, and again information is made available to doctors and laymen about the dangers of indiscriminate drug use. Accidental poisoning is also increasing, both due to household products especially kerosene, and due to drugs lying around the house.

In Conclusion, we have improved the paediatric health situation in Singapore, but, in doing so, we have altered the pattern of paediatric diseases, which now tend to resemble that seen in the West. As paediatricians we have to be aware of these changes by constant monitoring, and adapt our priorities for health education and therapy accordingly.

TABLE XV

Country	Infant Mortality Rate/1000 L.B.	Health Budget As % of National Budget	Doctor-Population Ratio
Austria	23.4		1/530
Bulgaria	25.4		1/530
Czechoslovakia	21.4	7.86	1/461
Denmark	12.2	21.9	1/600
Finland	11.27	21.1	1/849
Canada	15.5	35.9	1/670
Ireland	17.7	23	1/830
Norway	11.3	27.1	1/690
Britain	15.5	14.9	1/340
Australia	16.7		1/790
Japan	11.3		1/860
New Zealand	16.5	19.6	1/850
Singapore	13.9	4	1/1260

CT Imaging of the Brain

By
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and
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It was perception more than chance that the head was the first region in the body selected for study by computerised tomography (CT). As related in the preceding article, the inventor of CT, Godfrey Hounsfield "struck oil" with the very first patient examined in 1971. The historic CT scan revealed the presence of a frontal lobe tumour which would not have been shown by conventional radiography, i.e. without the aid of invasive procedures such as angiography.

CT is a revolutionary and painless method of x-ray imaging in which the head as well as the rest of the body is examined in a series of contiguous slices (Fig. 1). In this way, a three-dimensional picture of the intracranial contents, or for that matter, any other part of the body can thus be gained.

The outstanding advantage of CT over conventional radiography lies in its ability to differentiate most types of body tissues including abnormal tissues. This remarkable sensitivity of the CT equipment is related to the fact that body tissues absorb and deflect x-rays (a process called attenuation) in varying degrees, directly dependent on its constituent structures. Conventional radiography has, despite 80 years of technological advances, been unable to exploit fully the differential rates of attenuation.

It can be seen from Fig. 2 that at one end of the scale, bone with a high calcium content attenuates the x-ray beam quite considerably. At the other end, air present in the respiratory system and in the gut absorbs relatively little x-rays. Midway is water which is conveniently taken as the reference point and given the zero value.

On the EMI scale which is widely adopted, bone has an attenuation value of +500 units and more, and air -500 units. Cerebrospinal fluid (c.s.f.), akin in many respects to water, has an attenuation value of 0 to 1 EMI units. Fat exhibits an interesting and useful physical property in that it attenuates x-rays less than water and has an EMI value of -40 to -50 units. It is interesting to observe that conventional radiography, as opposed to CT, can differentiate, in the main, just four body components, namely bone, air, fat and other tissues lumped together as "soft

tissues".

The head was first studied in the pioneering days of CT scanning for one very good reason. Each scan lasted 5 minutes or more and it is imperative that the area under examination is kept absolutely still for optimal results.

As it turned out, the brain presents an unparalleled instance for anatomical imaging and depiction by CT due to a happy combination of factors. The brain is made up of two major components, namely c.s.f. and brain tissue with greatly differing attenuation values of 0 to 1 and 10 to 30 EMI units. The c.s.f. is present both in the ventricular system within the brain and also envelopes it by means of a complex network of cisterns. In addition, the mirror-image symmetry of both halves of the brain affords an added advantage in assessing abnormality.

With the refinement of the CT equipment and improvement of its resolving power, the grey and white matter of the brain, in turn, can be identified by CT imaging due to slight differences of attenuation values. Those of grey matter measure 18 to 30 EMI units while those of white matter, because of the higher fat content, have a range of 10 to 18 EMI units. Thus, structures comprising mainly grey matter such as the basal ganglia and structures made up of white matter like the internal capsule can be recognised without difficulty.

A body tissue which can be readily identified within the cranium is extravasated blood. Blood with its iron content has a relatively high attenuation value, 30 to 40 EMI units in the case of congealed blood. Thus, cerebral haemorrhage can be diagnosed with ease by CT which is at present the only modality available capable of differentiating this condition from cerebral infarction. The site and size of the bleed can be mapped out with precision and if the haemorrhage has tracked into the ventricles, this can be spectacularly shown (Fig. 3). In addition, progress and resolution of the haemorrhagic area can be studied by sequential CT scans.

For the same reason, the presence of an extradural or subdural haematoma can be shown without difficulty in most cases (Fig. 4). CT scanning is also of value in cases of head injury in the identi-

fication and localisation of intracranial haemorrhage.

Like cerebral haemorrhage, cerebral infarction gives rise to CT features which are interesting and often specific for the condition. CT scanning is indicated as a preliminary investigation to distinguish this condition from other causes of strokes such as cerebral haemorrhage and disease processes simulating infarction such as extracerebral haematoma. The picture of the evolution, progression and finally regression of an infarcted area of brain is not just a matter of academic interest but also of practical importance.

Since the early days of CT scanning, this modality is used to detect any space-occupying lesion, often with gratifying results. Due to alteration of the attenuation values, the mass lesion can be portrayed, and its exact size

(Continued on Page 11)

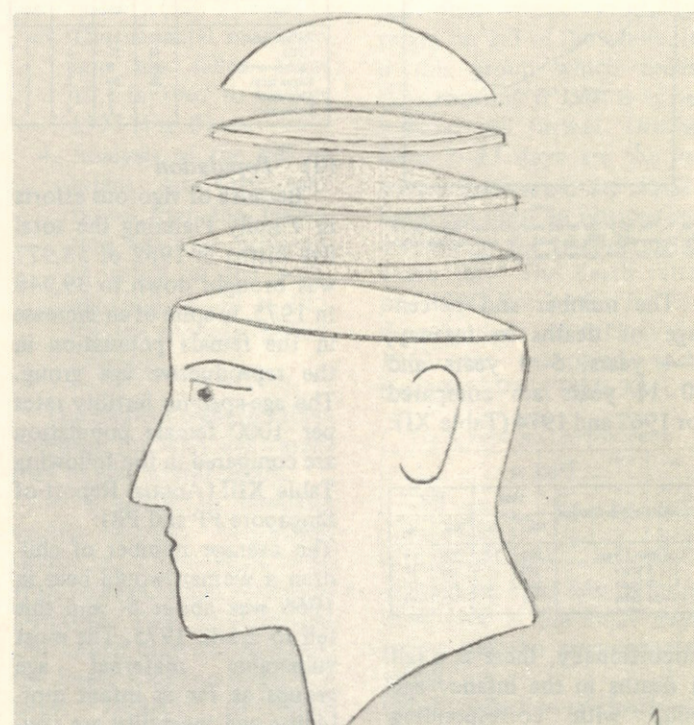


Fig. 1. Mode of examining the skull and the intracranial content in slices by CT scanning as diagrammatically shown.

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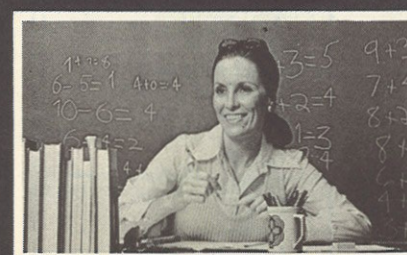
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CT IMAGING OF THE BRAIN

(Continued from Page 10)

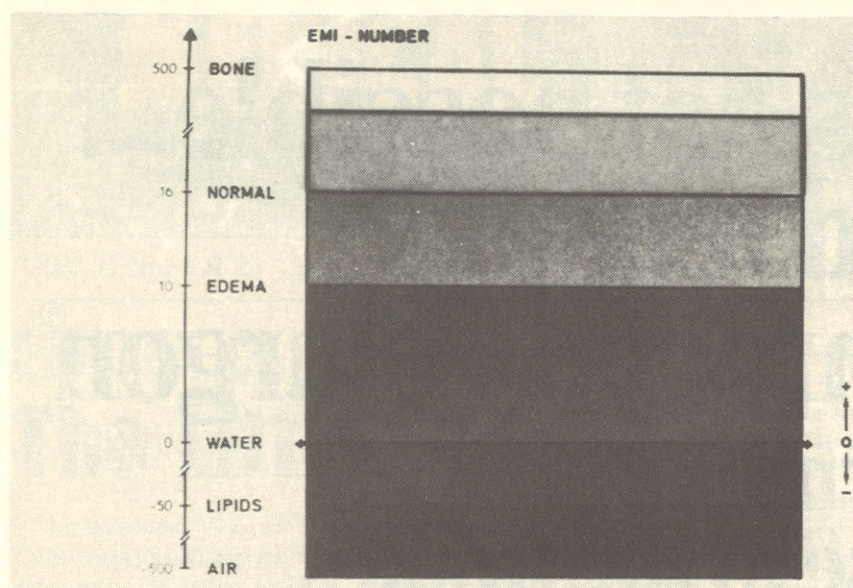


Fig. 2. Schematic illustration showing the density or grey scale related to the EMI units. The attenuation value of normal white matter is about 16 units and oedematous white matter about 10 units. It can be seen that the "soft tissues" of the body have a fairly wide range of attenuation values, e.g. muscle 20-25 units and liver, spleen and kidney 25-35 units.

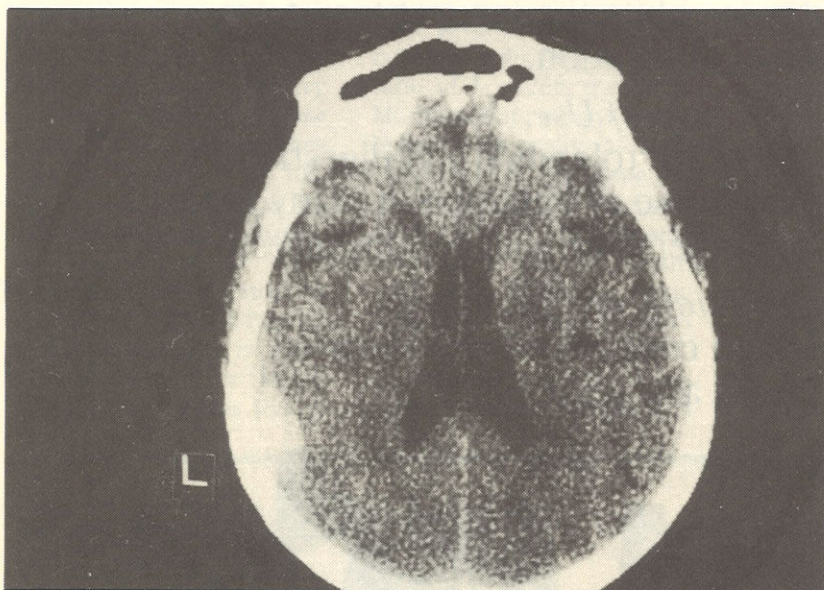


Fig. 4. A small extracerebral haematoma is present on the left side as a result of trauma. The left lateral ventricle is smaller than its counterpart due to the haematoma and to the oedema in the left cerebral hemisphere.

and site as well as the extent of the surrounding oedema determined (Fig. 5). Its presence is also reflected by the distortion of the brain, particularly the ventricular system. Specific features of such a mass, e.g. the attenuation values, site and multiplicity of the lesion can offer a definitive diagnosis in many cases.

The diagnostic accuracy is further improved by contrast enhancement. Water-soluble media such as Conray injected intravenously, a procedure identical to that used in I.V.P. will increase the attenuation values of many tumours and other lesions (Fig. 5 and 6). This interesting phenomenon of contrast enhancement is related to the breakdown of the blood-brain barrier function in many disease processes and enables even isodense tumours such as an acoustic neuroma to be picked up with greater confidence.

It has now been generally accepted that CT scanning is the best single screening method for suspected brain tumours. The detection rate by this method is in excess of

90%. Difficulty, however, arises when the lesions are smaller than 1 cm in diameter especially when these have approximately the same attenuation values as brain tissue and do not enhance significantly after contrast injection.

It should be appreciated that in some cases, a histological diagnosis is not possible. On the other hand, certain tumours, e.g. meningioma, acoustic neuroma and chromophobe adenoma can be diagnosed with great accuracy from their characteristic sites and CT behaviour after contrast enhancement. However, with the detection of a brain neoplasm, angiography is also usually indicated to help the neurosurgeon to assess further its nature as well as its blood supply.

Of the other forms of space-occupying lesions, the detection of a cerebral abscess is of particular value and is often life-saving. The value of CT for other forms of inflammatory processes caused by bacteria, viruses and fungi, is still being investigated and it would appear

that at present, CT scanning is capable of detecting the established inflammatory disorders. This also applies to the various types of demyelinating diseases and degenerative conditions (Fig. 7).

Hydrocephalus, as expected, is readily demonstrated by CT scanning. Often, this is secondary to the presence of a mass lesion in the posterior fossa. Of great interest is the detection of normotensive hydrocephalus which is amenable to treatment and is often devoid of signs and symptoms except for progressive dementia.

The importance and great value of CT scanning in neurological diagnosis and management have been universally accepted. This modality of diagnosis has the overriding advantage over most other methods in that it is non-invasive and virtually harmless.

With the advent of CT, the use of more traumatic procedures such as pneumoencephalography and angiography and including craniotomy has been considerably reduced. These methods have their

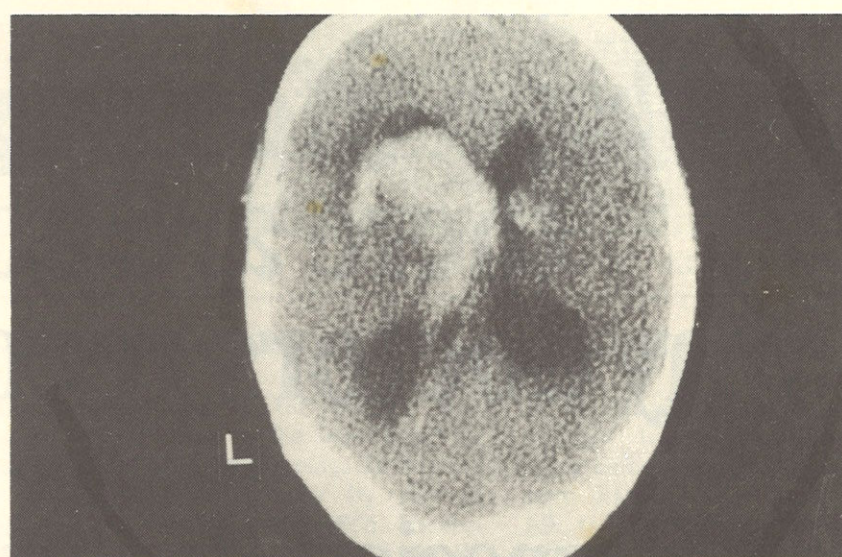


Fig. 3. Evidence of a haematoma in the left internal capsule and basal ganglia tracking into and filling the lateral ventricles. A small bleed is present in the right basal ganglia.

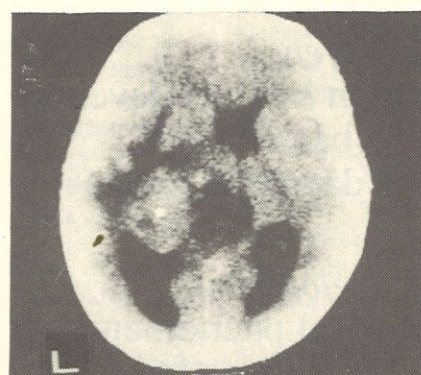


Fig. 5. A large tumour is present in the left temporal lobe surrounded by a wide zone of oedema. The ventricular system is dilated and deformed.

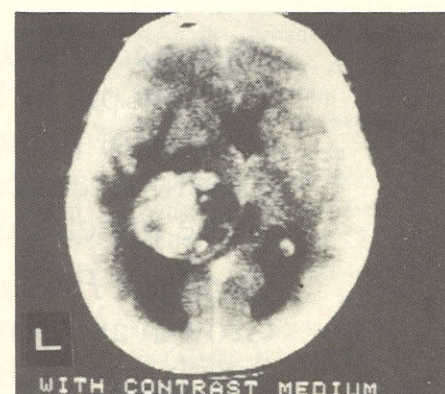


Fig. 6. After contrast enhancement, there is patchy increase of radiodensity of the tumour. A case of glioblastoma.

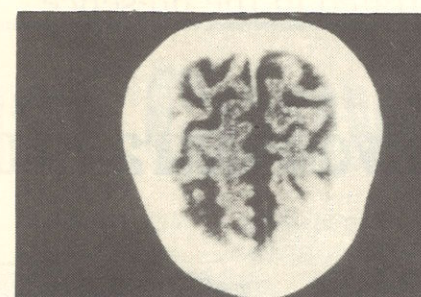


Fig. 7. A slice of the brain taken above the lateral ventricles showing enlarged cortical sulci, consistent with moderate cerebral atrophy. The ventricles (not shown) are dilated.

Value of CT Scanning

It is the only modality now available capable of revealing in a single examination:

1. Normal brain tissue
2. Brain tissue altered by neoplasm, infarction, inflammation, demyelination, etc.
3. Brain oedema
4. Extravasated blood
5. Cerebrospinal fluid
6. Some major blood vessels
7. Calcifications
8. Bone structure
9. Anatomy of orbits and paranasal sinuses

Major Indications of CT Head Scan

1. Any suspicion of organic brain disease as reflected by persistent headache, fits, etc.
2. Assessment of all head injury and its sequelae
3. Assessment of strokes and serial study for progress
4. Assessment of ophthalmic and ENT problems.

The third article which will appear in the following issue of the SMA Newsletter deals with the uses and limitations of CT scanning of the rest of the body.

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