The large *a* wave preceding the first heart sound in those cases complicated by pulmonary hypertension is probably caused in a similar way to that found in pulmonary stenosis (Laubry and Pezzi, 1913). As a result of peripheral pulmonary vascular resistance right ventricular hypertension occurs, and this then constitutes an obstruction to auricular systolic ejection, which in turn produces increased auricular systolic contraction and a large *a* wave in the venous pulse.

Summary

Inspection of the neck veins in children with atrial septal defect reveals a raised venous pressure and exaggeration of one of the waves of the venous pulse. Simultaneous auscultation identifies this large wave, by its time relationship to the second heart sound, as the *v* wave. When pulmonary hypertension is present in these patients the *a* wave also becomes larger than normal.

Recordings of the venous pulse in 25 patients with atrial septal defect compared with those of 16 normal children have confirmed these findings. They have also shown that there is exaggeration of normal systolic collapse in these patients, and this contributes to the prominence of the large *v* wave.

An attempt has been made to explain the haemodynamics of these changes in the venous pulse.

It is believed that the large *v* wave in atrial septal defect is a useful clinical sign, particularly in differentiating this condition from pulmonary stenosis.

I am indebted to Dr. Alexander Nadas for permission to include eight patients in this investigation who were seen at the Children's Hospital, Boston, Mass., and who have been mentioned in a previous communication (Reinhold and Nadas, 1954). I am also indebted to Dr. R. E. Bonham-Carter for his constant help and encouragement during this investigation and to Drs. J. F. Goodwin, C. H. M. Walker, M. G. Thorne, and J. P. M. Tizard for their constructive criticism of this paper. Mr. G. H. Bryant gave valuable assistance in helping to obtain the recordings.

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Writing in the *Scientific American* (February, 1955) on "A Study of the Anti-scientific Attitude," Bernard and Judith Mausner (respectively a social psychologist and a physician) ask: "Can scientists draw any lessons from the anti-fluoridation outbreaks?" These writers attribute the strength of the opposition to the fluoridation of water supplies to three main factors. "Firstly, the anti-fluoridation arguments are understandable, easy to follow. Their weaknesses are often difficult for a layman to grasp. Secondly, these arguments are grounded in some of the most widely held ideas and emotions of our culture. In their appeal to respect for individual rights, to fear of poison, to a watchful conservation of public funds, they ring a bell for most people. Thirdly, they are clearly related to the *Zeitgeist*, the current suspicion of scientists, the fear of conspiracy, the tendency to perceive the world as menacing. In contrast, the proponents of fluoridation have all too often ignored public psychology in presenting their case. They have relied too heavily on the fiat of organized science, and have tended to dismiss opponents as 'crackpots' and to deride their arguments. The greatest flaw has been the failure to prepare the public adequately. As a result there develops a polarization of attitudes which makes it very difficult to change opinion."

FRACTURES OF NECK OF FEMUR

INCIDENCE AND IMPLICATIONS

BY

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This investigation is concerned in assessing current and future problems in the organization of treatment for fractures of the neck of the femur.

In June, 1952, a fracture and orthopaedic unit was opened in the Royal Infirmary, Dundee, to which all fractures in the city and environs are referred. This survey has been made in the belief that the 190 cases encountered in the two years completed are the total incidence and unselected. The technical details of treatment and results have not been considered except in so far as they bear on principles involved.

The series is thought to be unselected for the following reasons: (1) The region is small and the fracture and orthopaedic service complete. Fractures are no longer treated in the general surgical wards of the teaching or other hospitals. (2) All such cases are treated in a 66-bed unit in the teaching hospital, which is associated with a 280-bed country orthopaedic hospital carrying out most of the interval orthopaedic treatment for the region. (3) No recent fracture of the neck of the femur from Dundee or the environs was treated in the country hospital. (4) No case was refused admission for any reason whatsoever. (5) The small number of nursing-home cases has been included.

Classification

Study of the age incidence shows a clearly defined distribution, as is apparent in Table I. It seemed significant that two female patients under 50 had had violent falls at work,

TABLE I.—*Pattern of Incidence (Female): City of Dundee Census Area*

Age (Years)	Cases, 1952–3	Cases, 1953–4
Under 50	0	0
50–54	1	1
55–59	4	1
60–64	3	3
65–69	7	3
70–74	11	13
75–79	8	10
80–84	10	8
85–89	3	7
90–	1	3
Total	48	49

while none over 50 had. In the men, however, major accidents are equally scattered over the normal life-span. The average age of the male patients is lower, as shown in Table II. The average for the female patients of 75 years is higher than in previous series (Stebbing, 1927, 69 years; Watson-Jones, 1935, 60 years; Murray and Frew, 1949, 62 years). This bears out the unselected nature of the series and, presumably, the significance of the ageing trend of population distribution. The source of the classical fractures of the upper end of the femur is thus determined by age.

TABLE II.—*Average Age (190 Cases)*

Sex	Fracture Type	Average Age	Cases in 2 Years
Male	Cervical	66·8	14
„	Trochanteric	65·5	36
Female	Cervical	75·8	67
„	Trochanteric	75·4	73

The further classification of the cases as cervical or trochanteric fractures follows the accepted anatomical and prognostic points of differentiation.

Inferences from the Survey

For the reasons stated it has been found possible not only to analyse accurately the problems in management and disposal but also to relate the cases to the known population at risk. The figures thus obtained are thought to give the first accurate estimate of the incidence of these injuries. Of the 190 cases recorded, 130 arose in the districts included in the population census for the city of Dundee in 1951. The latter alone have been considered in calculating fracture rates per 100,000 population of like age and sex. It was impossible to relate the country cases to the rural population: some patients from outlying districts go to hospitals in other regions. This group of cases has been included only in analysing management and disposal.

Finally, the fracture rates have been applied to the projected population estimates for 1965 and 1975, with a view to determining the effect of the expected change in distribution by age of the population, and this is shown in Table III. The calculation has not been presented for male cases.

TABLE III.—*Total Incidence (Female)*

Age Group (Years)	1952–3		1965		1975	
	Population at Risk	Annual Cases	Projected Population	Expected Cases	Projected Population	Expected Cases
50–54	6,393	1	6,300	1	6,500	1
55–59	5,494	2	6,400	3	5,400	2
60–64	4,864	3	5,900	4	5,700	4
65–69	4,191	5	5,200	6	5,400	6
70–74	3,327	12	3,900	14	4,500	16
75–79	2,416	9	2,800	10	3,400	13
80–84	1,136	9	1,700	13	2,000	16
85–	513	7	900	12	1,000	14
Totals		48		63		72

It is difficult to distinguish the classical fractures of elderly men from those due to violent accident. It is for the same reason that the annual male incidence is variable as compared with the regular, annual, and inevitable group of female cases.

Incidence

The two yearly totals of female cases did not differ; and the distribution followed such an orderly pattern that the picture does not appear to have been distorted by any gross inaccuracy (Table I). The cases from the specified area, and not resulting from major trauma, have been related to the population at risk. Fracture rates per 100,000 of each age group have thus been calculated on the basis of the average annual admissions. It is clear, with the continuing trend towards a greater proportion of elderly people, that the incidence of these fractures must increase. This increase has been estimated on the Registrar-General's projected population tables. The estimate is probably conservative, as it appears that the risk of this injury increases greatly with age.

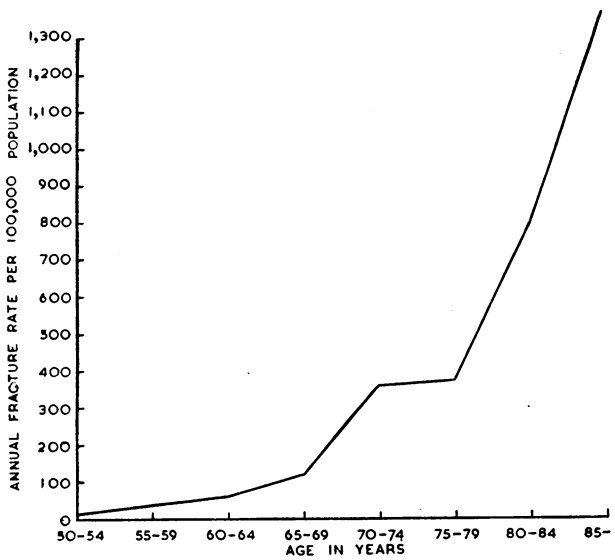

FIG. 1.—Risk of injury (females).

A graph showing this increasing risk is produced when the fracture rates are plotted against the age groups to which they apply (Fig. 1). Thus, not only will there be more elderly people at risk, but their average age, by being higher, will fall in an age group even more prone to these injuries. Since the incident of fracture is related to the senile state of the bone rather than to a particular mechanism, these cases must always occur. Accordingly the tendency to house ever more elderly people in institutions is in itself no safeguard. Indeed, four cases in this series came from such institutions. This is in agreement with the finding that the commonest single accident of those thus injured at home was a fall at the bedside.

The annual number of such fractures is important in planning an accident service. The cases in this series constituted 7% of the male and 20% of the female admissions.

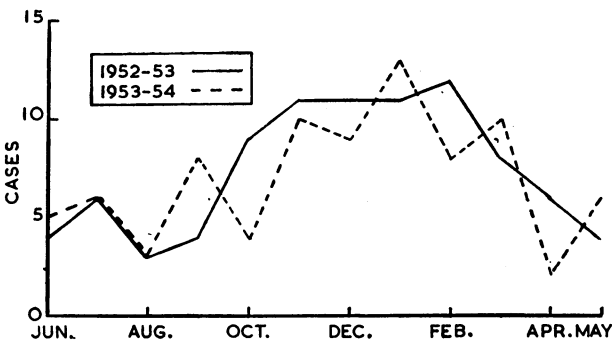

FIG. 2.—Seasonal incidence (females).

The fuller implication of this is to be found in analysis of the actual stay in hospital. Even when 78% of cases were treated operatively the average duration of stay was a few days more than that of all the other types of cases. The female cases actually occupied 22% of the bed-days for their ward in a year.

A seasonal increase in incidence was found to be a reality, as shown in Fig. 2. The explanation of this is not clear. In two consecutive wintry weeks in which came the highest number, no patient was injured in a fall out of doors. Most probably the physical integrity of elderly people is so delicately balanced that the slightest indisposition can upset it. On the other hand, the gale of 1953 which caused so many national disasters blew over three old people in the street, thus increasing the incidence for that month by 50% in a single blast.

Implications

Certain general observations on management seemed relevant to the organization of treatment.

1. Two methods of operative treatment were used. The standard operation was the insertion of a stainless-steel Smith-Petersen nail of the King type or of a similar nail bolted to a McLaughlin plate. Standardization of procedures in this way obviates the necessity for a multiplicity of internal fixation appliances and instruments related thereto. It also familiarizes the surgical and nursing team with the method. This surgical technique had an interesting sequel in one case. The patient first had a cervical fracture nailed. One year later, while freely ambulant, she sustained a

trochanteric stress fracture. This was successfully treated by bolting a plate to the nail already in position. Only two cases were treated by other surgical means.

2. No matter how skilful or experienced the surgeon, the insertion of a nail-plate and screws requires so many separate actions that the minimum time taken is considerable. The insertion of a Smith-Petersen nail alone is delayed only by difficulties in reduction or radiography. The introduction of such advances as xeroradiography will be a matter of importance in reducing the time taken. The hours spent on fractures of the femoral neck give some index to the number of surgeons, anaesthetists, and other staff required to meet the inevitable increase in cases.

3. The patients in this series were treated by a group of surgeons with similar views favouring early operative intervention. Thereafter, immediate mobilization was encouraged by the nursing and physiotherapist staff; no weight-bearing was allowed for approximately three months, at which time walking was recommenced with crutches. Operation was performed on 78% of the patients; only one died within twenty-four hours of operation and none during it. Forty-four patients were treated otherwise. Incidental medical conditions were the contraindication on 26 occasions. The length of time since injury was a reason 15 times. Other reasons were: undisplaced trochanteric fractures, 5; grossly comminuted and technically subtrochanteric fractures, 5; refused operation, 2; suitable internal fixation material not available, 2; trochanteric fracture, opposite leg short, 1.

4. The assessment of the patient's general condition was frequently time-consuming. The 190 patients presented a total of 151 significant pathological states. No less than 58% were discovered to have one or more incidental medical conditions of such severity as to influence decisions on treatment and prognosis. In the making of these decisions much help was given by the anaesthetists and physicians, who, as the series progressed, found noticeably fewer absolute contraindications to what were often regarded as life-saving operations. It is difficult to decide at which stage a patient with chronic exudative bronchitis will fare worse from surgery than from the restrictions associated with anything short of superlative non-operative measures. Deaths from chest complications in patients known to be bronchitic were, as expected, less common after nailing than during traction. In this connexion, too, difficulty was encountered in deciding the primary cause of death in fatalities. The cause given was found to vary more with the individual house officer than with any other consistent factor. Frequently it was no easier for the senior staff to decide.

5. The patient's general condition often appeared to improve for at least the first twelve hours after admission. After that, the opportunity for surgery, if not soon taken, seemed lost. This physical reaction, whether due to stress and its subsequent exhaustion or not, was paralleled in the mental reactions.

6. It rarely seemed necessary to intervene within hours of the accident; and such routine early operating could lead too readily to a reputation for ruthlessness which might not be entirely unfounded.

7. There were on average three of these operations a fortnight, each occupying one to one and a half hours' theatre time. A considerable load could thus be placed on the night staff if emergency reduction and internal fixation were routine. This was, however, sometimes done. One session included four cases. Accordingly, 76% were carried out within 24 hours and 93% within 48 hours of admission; 70% of the patients had been admitted within 24 hours of fracture.

8. The later ward management demands attentions other than the all-important one of devoted nursing. The proportion of elderly patients, when high, has a deleterious effect on ward morale. This is due largely to the nocturnal disturbances of those disorientated by senile cerebral ischaemia. In the series no fewer than 9% had cerebral arteriosclerosis to the point of having had a catastrophe resulting in paresis; a greater number were disorientated. This aspect of ward management has already had deserved publicity with regard to the nursing of adolescents (Stuart-Clark, 1953). The sounds associated with the inevitable deaths and the utterances of the senile arteriosclerotic dements are not for young ears. It appears, therefore, that some form of segregation is necessary. In view of the expected large total increased incidence it seems probable that the answer will be found in total segregation of the female cases in special accommodation.

9. The high percentage returned to normal is discussed under the heading of disposal of the patients. This factor alone would supply an incentive to those nursing cases of fracture of the neck of the femur which is not enjoyed in geriatric wards. Further, this branch of nursing is a specialized matter which segregation would facilitate.

Disposal

In recent years much has been said of the difficulties in discharging elderly patients from hospital. Here, considerable help was forthcoming from patients' relatives, friends, and general practitioners, as shown by the disposal of 114 patients (Table IV). Of those who went home, 16 had previously lived alone. They spent an average of 46 days in hospital, a time not greatly beyond the general average.

TABLE IV.—*Disposal of* 114 *Patients*

Discharged to own home or to relatives or friends		80·7%
Discharged to the geriatric unit		12·3%
Previously lived alone	7	
Previously lived with someone	5	
Previously lived in institution for elderly	1	
Originally admitted from geriatric unit	1	
Discharged to nursing-home, cottage or other hospital		7·0%

In this series, in which mortality was high and morbidity low, the main problem was not one of the institutional disposal of an invalid, but of the delay in gaining access to the care of a relative for rehabilitation, whether the patient lived alone or not (Ferguson and MacPhail, 1954). It was noted, however, that some aged patients progressed less well after return home, for no other apparent reason than that discharge from hospital removed the only remaining incentive to the will to live.

Results

It is appreciated that results of treatment cannot be assessed at this stage. The comment, however, seems justified that, on a short-term basis, morbidity was low.

The mortality figures at the end of the two-year period are shown in Table V. The high mortality rate for trochanteric fractures in women needs explanation. In the first instance

TABLE V.—*Mortality (*190 *Cases). Overall Mortality* = 31.6%

Sex	Fracture Type	Operative Treatment		Conservative Treatment	
		No.	Deaths	No.	Deaths
Male	Cervical	12	5	2	1
,,	Trochanteric	21	7	15	3
Female	Cervical	61	16	6	3
,,	Trochanteric	52	20	21	5

a high overall mortality reflects the veracity of the unselected nature of the series. The 52 operation cases presented with a total of 41 serious incidental medical conditions, whereas the 21 treated without operation presented with only six serious incidentals. The explanation for this is that the majority of the cases treated conservatively happened to be so treated for reasons not likely to affect the prognosis adversely—namely, undue time from fracture till admission, gross comminution, lack of suitable internal fixation

apparatus, or patients' refusal to avail themselves of surgery. Finally, no death occurred in this group other than among those treated conservatively because of some serious incidental condition.

Summary

The total incidence of fractures of the femoral neck during two years is analysed.

The inevitable increase in incidence, which is applicable generally, is calculated.

Additional staff and accommodation will probably be required for this contingency.

The suggested segregation of female patients is discussed.

Problems in treatment and disposal are outlined.

I am indebted to Mr. I. S. Smillie, surgeon in charge, Eastern Region (Scotland) Orthopaedic Service, for much encouragement and constructive criticism; also to the surgical and secretarial staff for all their help.

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SULPHAEMOGLOBINAEMIA

A REPORT OF FIVE CASES

BY

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Cyanosis in warm skin, in the absence of obvious disease of the cardiovascular and respiratory systems and of polycythaemia, calls for spectroscopic examination of the blood, and in a proportion of such instances either methaemoglobin or sulphaemoglobin, or both, may be identified.

Methaemoglobin consists of oxidized haem linked to native globin, and is present in traces in normal erythrocytes, in which an enzyme system constantly reduces any methaemoglobin. This enzyme system is probably defective in congenital methaemoglobinaemia. Sulphaemoglobin, in contrast, is invariably a pathological product. Its exact chemical constitution is unknown, but it is thought that a sulphur atom has been incorporated in the pyrrole components of the haem molecule and that the mode of linkage of the haem to the globin moiety is altered. There is no intracellular mechanism for the reconversion of sulphaemoglobin to haemoglobin, nor can reconversion be effected by any known drugs. Sulphaemoglobin remains in the erythrocyte, an irreversible product of haemoglobin metabolism and a harmless though inert pigment, until the cell is destroyed, and there is no evidence that the formation or retention of sulphaemoglobin shortens the average life span of the cell. The only ill effect that can be attributed to it is anoxia, due to the immobilization of oxygen-carrying haemoglobin in the form of an inert pigment.

Both pigments are identified by the presence of an absorption band in the red part of the light spectrum—the methaemoglobin band at 625–655 millimicrons, and the sulphaemoglobin band at 615–630 millimicrons. The absorption band of methaemoglobin is dispelled when a few drops of 5% potassium cyanide are added to the laked blood. This procedure leaves the absorption band of sulphaemoglobin unchanged, but it disappears on adding hydrogen peroxide alone.

In the human subject sulphaemoglobinaemia may follow the ingestion of compounds belonging to two groups: (1) nitrogen-containing compounds such as potassium nitrate, sodium nitrite, or nitroglycerin; and (2) aromatic amino-compounds, such as the sulphonamides or the aniline derivatives acetanilide and phenacetin.

Many cases of sulphaemoglobinaemia due to drugs have been reported in recent years, and the following five patients present few new features, but several aspects of their histories merit discussion.

Case 1

A spinster aged 70 came into hospital on October 26, 1951, complaining of feverishness and of pain in the right iliac fossa and in the back for two weeks. She was accustomed to taking saline aperients regularly, and her bowels were more constipated than usually. She had taken only a few aspirin tablets for the pain.

She was febrile, pale, ill, and not cyanosed. The fingers were clubbed. A blood count showed: Hb, 11.9 g.% (Sahli); red cells, 3,860,000 per c.mm.; P.C.V., 40%; M.C.V., 104 cubic microns; M.C.H.C., 29.75%; white cells, 9,200 per c.mm.; E.S.R., 73 mm. in one hour (Westergren). The urine showed a trace of albumin, no excess of urobilin, and no other abnormality. Clinical and radiological examination suggested a resolving pneumonia, and acute osteomyelitis of vertebrae D 12 and L 1 was diagnosed later. Both conditions resolved with antibiotics.

Aspirin was prescribed for her pain. On October 31 she was cyanosed, and spectroscopic examination of the blood showed a well-marked band in the red due to sulphaemoglobin. On December 17 sulphaemoglobin was still present in a 1 in 20 dilution of blood, examined in a 1 in. (2.5 cm.) thickness. On January 7, 1952, during chloramphenicol therapy, the patient developed loose stools from which type-specific *Bact. coli* (beta type) was grown. The diarrhoea stopped on January 16, and five days later no sulphaemoglobin was detected in a 1 in 5 dilution of blood. The patient went home on March 5.

She was readmitted in October, 1952, with gastric carcinoma. There was no cyanosis, and no sulphaemoglobin was detected.

Case 2

A widow aged 66 had suffered from a duodenal ulcer for 16 years, and was admitted on October 12, 1953, following a haematemesis. She had been subject to headaches most of her life, and had taken an occasional "askit" powder to relieve them. For a year her headache had been very severe and persistent, and her weekly consumption of powders had been two to three dozen. At night she took two compound codeine tablets. For 16 years she had regularly taken a powder thrice daily after meals, which was prescribed by her doctor to prevent her ulcer pain and to keep her bowels regular. For six to seven months she had had paraesthesiae of the hands and feet.

On admission she was slightly cyanosed. The haemoglobin was 4.2 g.% and R.B.C. 2,070,000 per c.mm. The urine showed green to Benedict's solution; no albumin or excessive urobilin. Next day sulphaemoglobin was detected in a 1 in 75 dilution of blood. Its concentration slowly declined, and on December 3 it was detectable only in 1 in 20.