apparently connected to a nucleolus by a fine chromatin thread. The sex-chromatin body may appear flattened, convex, tent-shaped, or diplococcoid at the nuclear membrane. It may also lie in the centre of the nucleus, but it cannot always be distinguished from a nucleolus, and such centrally placed chromatin bodies are therefore not suitable for enumeration. Nuclei which are unsuitable for sexing include those which are pyknotic and degenerating (Fig. 3), crumpled and crenated, or contaminated by bacteria, although these may be eliminated by careful focusing.

In males with medullary dysgenesis and chromatin-positive nuclei (Fig. 4) the sex chromatin body is exactly comparable to that found in a normal female. In the triplo-X female some nuclei have two such chromatin bodies (Fig. 5). These are positioned at random on the nuclear membrane, opposite, adjacent, or closely adjacent to each other. In some chromatin-negative nuclei derived from normal (XY) males a slim heterochromatic crescent is discernible at the nuclear membrane. A similar structure is present together with sex chromatin in some chromatin-positive nuclei derived from male subjects with medullary dysgenesis (XXY) but apparently absent from nuclei derived from normal (XX) or from triplo-X (XXX) females.

Discussion

Orcein has several advantages for nuclear sexing. These include ease of preparation, rapidity of sexing, and the revelation of fine details of nuclear structure.

Ease of Preparation and Rapidity of Sexing.—Orcein preparations may be made with extreme ease and rapidity, and scrutiny is facilitated by squashing, which enlarges the nuclei. Simple aceto-orcein is better for rapid sexing since it stains so very quickly. Lacto-aceto-orcein is recommended for survey work, as temporary preparations may be made with great facility at the rate of 250 an hour but may be scrutinized at leisure because they do not deteriorate for several weeks. The value of the technique for survey work has been demonstrated by our results, which are consistent with recent large surveys of male (Barr *et al.*, 1959) and female (Fraser *et al.*, 1960) oligophrenic patients. Our results also provide some additional data of value in establishing the incidence of sex-chromosome anomalies in such populations.

Revelation of Fine Detail.—Squashing of the nucleus, with subsequent enlargement, permits study of its fine structure. The fine chromatin thread which apparently connects the sex-chromatin body to a nucleolus was first recognized by Reitalu (1957) in foetal tissue, and was subsequently described by Serr and his co-workers (Serr *et al.*, 1958; Lennox *et al.*, 1960) in tissue-culture material. In view of the difficulties of sexing encountered in foetal tissue (Park, 1957) and in tissue culture (Miles, 1960) the recognition of this structure in oral mucosal smears is of value. The importance of this structure with respect to the nature of sex chromatin is discussed elsewhere (Stewart, 1961). The discovery of a slim heterochromatic crescent in male nuclei stained by orcein (Sanderson, 1960) has been confirmed by other workers (Ohno and Makino, 1961). Evidence is as yet insufficient to correlate it with heterochromatin derived from the Y chromosome, although this is the most likely explanation of its presence in males (XY and XXY) and its absence in females (XX and XXX).

Summary

The sex-chromatin body is readily recognizable in oral mucosal smears stained with orcein. Simple aceto-orcein is recommended for rapid nuclear sexing, and lacto-aceto-orcein is recommended for survey work. In a survey of 245 males and 240 females in an institution for oligophrenic mental defectives two cases of medullary dysgenesis and one triplo-X female were found.

The aceto-orcein method reveals fine details of intranuclear structure, including a structure found in the nuclei of subjects with a Y chromosome and perhaps related to heterochromatin derived from this chromosome.

We are indebted to Dr. M. M. Macrae, physician-superintendent, Strathmartine Hospital, Dundee, for permission to investigate patients under his care and for facilities associated with the survey. We are indebted also to Mr. J. Scott, of the Natural History Department, for technical assistance.

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Medical Memoranda

Traumatic Rupture of the Heart

Rupture of the heart after myocardial infarction has long been recognized as a dramatic and rapidly fatal complication. The incidence of rupture of the ventricle subsequent to acute myocardial infarction is given as between 1 and 10% of the post-mortem cases of myocardial infarction (Kohn, 1959).

A rather less common cause of rupture of the heart is that following trauma to the body, in which the chest wall or pericardium remains intact (Crane, 1952). The diagnosis of this condition is difficult, as the following case report shows. After trauma to the body, in which the chest wall or pericardium remains intact, rupture of the healthy myocardium can only conceivably occur as a result of profound changes in intrathoracic and intracardiac pressure.

Cardiac trauma produced by contusive and concussive forces may lead to disruption of the cardiac musculature (Bright and Beck, 1935). Cardiac tamponade, with an ultimately fatal issue, will occur after a varying lapse of time (Pollock *et al.*, 1952). Recovery may occur after

traumatic infarction of the heart (Anderson, 1940). The successful suture of a ruptured myocardium after non-penetrating injuries has been carried out (Desforges *et al.*, 1955).

CASE REPORT

A married woman aged 46 was admitted to hospital at 3.25 p.m. on April 10, 1960. She was driving a motor-car, and in a collision her chest had been crushed against the steering-wheel. She had been unconscious prior to admission, but when admitted was conscious though mentally confused. Her blood-pressure was 40/? mm. Hg and a noradrenaline infusion (4 ml. to 1 pint (570 ml.) of saline) was started at once. Whole blood was given as soon as it was available. The patient was very restless and there was some bruising of the anterior and the right side of her chest wall. The abdomen showed no rigidity or rebound tenderness, but guarding was present below both costal margins. The heart sounds were soft but clearly heard. Air entry was good into both lungs. X-ray examination of the chest revealed fractures of the fifth to the eighth ribs on the left side. There was no haemothorax. No fracture of the skull was noted on x-ray. It was felt that the cause of peripheral circulatory failure was rupture of some abdominal organ or haemorrhage from the liver. She was not considered fit for operation, and blood transfusions were continued.

At 10 p.m. the patient was mentally improved; she remembered the accident, and inquired after passengers. The next morning her blood-pressure was maintained at 80/60 mm. Hg and the pulse was 120. Breathing was laboured, but air entry was good on both sides. X-ray examination of her chest revealed a small collection of fluid at the right base and a right interlobar fissure. There were vigorous bowel sounds. An E.C.G. taken showed (a) sinus tachycardia of 140 beats a minute, (b) right axis deviation, (c) low voltage. These signs did not indicate any specific lesion, and there was nothing to suggest cardiac tamponade. In the afternoon the patient was seen by a thoracic surgeon, who felt that there was no haemopericardium or traumatic myocarditis. He thought that the condition was due to rupture of the liver and advised further blood replacement.

At 3 a.m. on April 12 the patient clutched at her abdomen, drew up her legs and became very restless. On examination her blood-pressure was 80/60 and pulse 120. The abdomen was very tender and rigidity was present, especially in the upper half. She had had 6 pints (3.4 litres) of whole blood and 2 pints (1,140 ml.) of normal saline. It was felt that a laparotomy should be carried out immediately.

Premedication with atropine 0.6 mg. was given. The patient received 200 mg. of thiopentone and 30 mg. of tubocurarine. A cuffed orotracheal tube was passed and anaesthesia was by nitrous oxide and oxygen. Breathing was maintained by intermittent positive-pressure ventilation. Whole blood was given continuously throughout the operation. Laparotomy revealed a small amount of bile-stained fluid in the peritoneal cavity. The pancreas was contused, but no obvious rupture was found in any organ. The liver was enlarged and engorged. During the operation the patient's condition deteriorated, the blood-pressure being unrecordable, and peripheral cyanosis occurred in spite of vigorous inflation of the lungs with pure oxygen. The patient improved after the administration of 10 mg. of methoxamine, and this was later repeated. Atropine 0.6 mg. and neostigmine 2.5 mg. were given and spontaneous breathing started. On leaving the theatre the blood-pressure was 90/50, but the patient remained cyanosed in spite of being placed in an oxygen tent. She died about 15 minutes after returning to the ward.

POST-MORTEM REPORT

The body was that of a well-nourished young middle-aged woman showing abrasions over both knees and some bruising to the front of the chest. There were no other external signs of injury.

Thorax.—Two pints (1,140 ml.) of blood-stained fluid were found in each pleural cavity. There were some old adhesions over the right lung and fractures of ribs two to eight inclusive on the left side and front. **Heart.**—The pericardial cavity contained $\frac{1}{2}$ pint (425 ml.) of blood. The heart was normal in size; extensive bruising of the whole of its outer surface and a small rupture of the heart at the tip of the right ventricle were present. The valves and chambers were otherwise normal and the coronary arteries showed no atheroma. The muscle was a good colour. **Lungs.**—Both lungs were collapsed and showed acute congestion with acute oedema. **Abdomen.**—A midline abdominal operation had been done recently, and there was also an old midline abdominal operation scar. No free fluid or adhesions were seen. A drainage-tube had been present. **Liver.**—This was a little enlarged and flattened, extending down rather farther than normal into the abdominal cavity. There was some surface bruising in the subcostal region, but no evidence of deep bruising of the liver or lacerations. On section the organ showed chronic venous congestion. **Pancreas.**—There was a little bruising but no evidence of any external generalized pancreatitis. **Skull.**—Some bruising to the top of the scalp had occurred, but there was no evidence of fracture. **Brain.**—The cerebral arteries showed no atheroma. There were no abnormalities of the brain on the surface or on section apart from one area of bruising of the cortex 1 in. (2.5 cm.) in diameter situated over the left frontal lobe.

Cause of Death.—Death was due to extensive bruising, with a small rupture of the heart and bruising of the abdomen caused by recent pressure injuries to the front of the chest and abdomen.

COMMENT

The problems of diagnosing traumatic rupture of the heart when the chest wall remains intact were obvious in this case. This patient presented with internal haemorrhage and there were no signs to indicate traumatic myocarditis. She was overtransfused, and this may have been a contributory cause of death. In the light of the clinical findings it was believed that she was suffering from hypovolaemic circulatory failure, and that intravenous therapy with whole blood was the only way of saving her life.

With the increasing number of accidents on the roads, especially deceleration accidents in which the chest wall is injured by the steering-wheel of the car, traumatic rupture of the heart must be borne in mind.

Thanks are due to Mr. G. J. Walley for permission to publish this case, and to Dr. E. H. Seward for his valuable criticism and encouragement.

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The Walter and Eliza Hall Institute, in Melbourne, has received a grant of \$164,000 from the United States Department of Health. The money is to be used for the purchase of equipment to further research into what body cells do to protect themselves against disease, including cancer and the common cold. The work is being carried out by Dr. Gustav Nossal, who for the past two years has been working at Stanford University, California, under Professor Joshua Lederberg, who had earlier worked with him in Melbourne.