Operation.—On May 19, 1954, a left collar incision was made and the brachial plexus exposed. An aneurysm of the third part of the subclavian artery was present, the upper trunk passing anterior and lateral and the middle trunk lying also anterior to the swelling, both trunks being adherent to the aneurysm. The plexus was mobilized and the aneurysm resected after division of the clavicle to remove the distal portion; the anterior two-thirds of the cervical rib was excised and the wound closed. No fixation of the clavicle was provided, the arm being retained in a sling.

On May 24 the finger movements were normal, the left hand still colder than the right, but pain had been abolished. The radial pulse was absent. Shoulder movements were begun on the fourteenth post-operative day and the patient was discharged home. When seen one month after operation there were full movements of all the joints of the left upper limb, whilst the clavicle was firmly united and the grip of the left hand was equal to that of the right. He returned to his work of dyer's operative on June 30. In February, 1955, his left hand was slightly colder and paler than the right, but function was normal and no further symptoms had been experienced.

The pathological report by Dr. I. Stewart on the sections of the aneurysm was: "The inner wall of the vessel is deformed by a flattened excrescence coated by a thin layer of laminated fibrin. Its substance is of fibrillae in which cells of the type seen in cartilage lie in pockets singly or in pairs. There are three distinct zones: in one the cells are ranged in columns with small vessels and few fibrillae; in the second and third the structure resembles cartilage but the cells differ in number. The appearances indicate repeated intravascular thrombosis with subsequent organization and cartilage deposition."

Discussion

Both cases described above exhibited purely vascular symptoms, the common initial symptoms of pallor and dull diffuse pain due to ischaemia being well demonstrated. It was thought that the release of emboli from the subclavian aneurysm accompanied by vasospasm produced the vascular symptoms, and section of both specimens reported showed intra-arterial thrombosis. It is evident, however, that there was also a vasospastic element in the development of their symptoms, as shown by their amelioration and improvement in the circulation of the limb after operation. It is feasible to suggest that the vasospasm is due to irritation of the sympathetic fibres in all the trunks, as these were adherent and stretched over the aneurysm. But complete recovery occurred after only a few days, indicating that the vasospastic element was merely a factor in the production of symptoms.

In treatment, excision of the rib alone or scalenotomy without any attack on the aneurysm has often been advocated. It is suggested that excision of the aneurysm is essential to eliminate further vascular symptoms. In Eden's (1939) case excision of the rib alone proved insufficient to prevent further embolic phenomena, and it is for this very reason that excision of the aneurysm should be undertaken.

Summary

Theories of aetiology of the vascular symptoms associated with cervical rib are reviewed.

Two cases of subclavian aneurysm associated with cervical rib are described.

Complete excision of the aneurysm and rib is advised to prevent recurrence of symptoms.

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SPLINTER HAEMORRHAGES

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Splinter haemorrhages are recognized as a characteristic physical sign in patients with subacute bacterial endocarditis. They were first described in this condition by Horder (1920), who thought they were due either to "toxic" damage to capillary walls or to minute emboli. In their textbooks on cardiology Lewis (1942), White (1947), and Wood (1950) state that capillary fragility is increased in bacterial endocarditis and that the splinter haemorrhages and petechiae found in this condition are due to the abnormality in the capillaries. However, Bramwell and King (1942) consider that the white centres which are often seen in the petechiae in bacterial endocarditis indicate that they are embolic in origin.

McNaught (1939) and Sheldon (1941) described splinter haemorrhages seen in bacterial endocarditis in patients who had no other evidence of this disease, and this prompted us to investigate the incidence and significance of these lesions in more detail.

Present Investigation

We have examined the finger-nails of 429 patients and normal individuals and 35 cadavers. The lesions classified as splinter haemorrhages were all beneath the finger-nails; the toes were not examined. The lesions were usually brown or black in colour, but when fresh they were red, and changed in colour during the next few days; they did not blanch on pressure. They were 1 to 3 mm. long, linear, and longitudinally situated beneath the distal third of the nail. They did not fade or disappear spontaneously, but grew out with the nails and could eventually be cut off. As a rule the patient was unaware of their existence, but occasionally mild discomfort had been experienced. When the "haemorrhages" were associated with a history of recent trauma to the finger-nails they were ignored, as were blemishes which could conceivably have been due to dirt or

TABLE I.—*Incidence of Splinter Haemorrhages in Different Types of Disease*

Type of Disease	Patients with Splinter Haemorrhages		No. of Patients Without Splinter Haemorrhages
	No.	%	
Systemic arterial embolus (5 had mitral stenosis)	6	86	1
Probable bacterial endocarditis (mitral stenosis, negative blood cultures)	2	67	1
Uncomplicated mitral stenosis	10	44	13
Rheumatic fever (no evidence of mitral stenosis)	3	27	8
Proved bacterial endocarditis (mitral stenosis, positive blood culture) partially treated	1	25	3
Patients with marked purpura at time of examination	1	25	3
Arthritis other than rheumatic fever	1	20	4
Renal disease	4	20	16
Blood diseases not exhibiting purpura	6	19	25
Hypertension	3	18	14
Malignant neoplasms	4	17	19
Heart disease other than mitral stenosis	12	15	68
Miscellaneous	5	13	35
Pulmonary disease	11	12	79
Peptic ulcer	3	12	22
Nervous disease	3	11	24
Endocrine disease	2	11	17
Normal individuals	0	0	35

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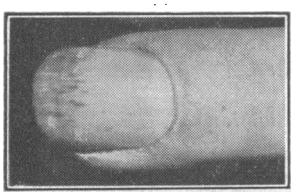
ridges on the nail. Each patient was examined once only, and therefore the actual incidence of the haemorrhages is probably higher than we report.

We found splinter haemorrhages in 77 of the persons examined; in 60 cases there was more than one lesion. The highest incidence (86%) was in seven persons who had suffered recent major arterial emboli (Table I). Five of these patients had mitral stenosis, one was suffering from partially treated bacterial endocarditis, and one had had a recent coronary thrombosis. Of the other patients with mitral stenosis, 44% exhibited splinter haemorrhages, but they were no more common in those patients who were also thought to have bacterial endocarditis. However, we did not have the opportunity to examine any untreated patients with this disease, and the incidence may be higher in such individuals. Splinter haemorrhages did not occur more often in persons with auricular fibrillation than in those with sinus rhythm. In all other diseases the incidence of these lesions was about 15%.

We did not find any splinter haemorrhages in our unselected series of 35 normal persons. However, since we have been interested in this subject about a dozen acquaintances in normal health have shown us their nails, demonstrating lesions which we classify as splinter haemorrhages. We have gained the impression that they are particularly liable to occur after repeated jarring of the hand, unassociated with direct trauma to the nail. For instance, 4 out of 12 healthy young women who had played hockey during the preceding week had splinter haemorrhages under their finger-nails. The photograph shows splinter haemorrhages under the nail of an emphysematous diabetic patient with no cardiac disease who was employed in making packing-cases. Five of his finger-nails showed splinter haemorrhages, but he had no recollection of injuring his fingers recently. None of the seven persons with splinter haemorrhages who were examined after death had any demonstrable ante-mortem intracardiac thrombus. However, two had had recent major systemic arterial emboli and two had had pulmonary emboli. One of the latter had a valve-type foramen ovale, and one of the remaining three patients had gross atheroma with ulceration of the aorta. None of the 28 patients without splinter haemorrhages who were examined after death had had systemic emboli, and only two had had pulmonary emboli.



Splinter haemorrhages under the finger-nail of a man suffering from diabetes and emphysema.

We estimated the capillary fragility of 139 of our patients by means of Hess's test, performed in the following manner. A sphygmomanometer cuff was placed on the upper arm and inflated to midway between the systolic and diastolic arterial blood pressures for five minutes. A count was made of the petechiae which were produced in a circle 1 in. (2.5 cm.) in diameter drawn on the skin of the antecubital fossa. Ten or more petechiae were regarded as indicating excessive capillary fragility.

The capillary fragility was no greater in the patients who had splinter haemorrhages than in other persons (Table II). We did not find that the capillary fragility was increased in our partially treated patients with subacute bacterial endocarditis. Only one out of four grossly purpuric patients had any splinter haemorrhages.

Nail parings containing splinter haemorrhages which had grown out were treated with benzidine and barium peroxide. The lesions gave the green coloration characteristic of altered blood. Nail parings were stained with eosin and examined histologically. The splinter haemorrhages appeared to consist of a homogeneous mass of altered blood embedded in a layer of squamous cells adherent to the under surface of the cut nail.

TABLE II.—*Capillary Fragility in Patients With and Without Splinter Haemorrhages*

Type of Disease (Same Classification as in Table I)	Patients with Splinter Haemorrhages		Patients with no Splinter Haemorrhages	
	Total No. of Patients Examined	No. with more than 10 Petechiae after Hess Test	Total No. of Patients Examined	No. with more than 10 Petechiae after Hess Test
Systemic arterial embolus	3	1	0	—
Probable bacterial endocarditis	0	—	2	1
Uncomplicated mitral stenosis	7	1	5	3
Rheumatic fever	0	—	3	2
Proved bacterial endocarditis	0	—	2	1
Patients with marked purpura at time of examination	1	0	3	1
Arthritis	0	—	2	1
Renal disease	1	0	6	2
Blood diseases not exhibiting purpura	4	1	13	5
Hypertension	0	—	6	5
Heart disease other than mitral stenosis	0	—	15	4
Miscellaneous	4	0	13	2
Pulmonary disease	6	1	13	5
Peptic ulcer	2	1	4	1
Nervous disease	2	0	2	2
Endocrine disease	1	0	6	2
Normal individuals	0	—	13	2

The difference in incidence of the splinter haemorrhages in normal persons, patients with mitral stenosis, and patients with other diseases confirms our belief that the lesions are neither artifacts nor due to direct trauma to the nails. We do not think they are analogous to petechiae produced by haemorrhages from capillaries, for the following reasons. Splinter haemorrhages are linear, longitudinally placed under the nails, and do not fade as they age, characteristics which would not be expected of capillary haemorrhages. The frequency of these lesions in patients with uninfected mitral stenosis and with no signs of active rheumatic disease makes it unlikely that they are due to a toxic process acting on the capillaries, and the normal capillary fragility in these people confirms this. On the other hand, patients with mitral stenosis frequently have thrombus in the left auricle and are liable to arterial emboli. The high incidence of splinter haemorrhages in these people, and especially in those who had had recent large emboli, supports the other clinical evidence, which suggests that these lesions are embolic in origin.

However, if splinter haemorrhages are emboli in terminal digital vessels it is difficult to explain how they grow out with the nails and become embedded in the avascular squamous epithelium on the under surface of the nail. The histological appearance of splinter haemorrhages and their relation to the other tissues in the finger-tip is to be investigated further.

Summary

Examination of the finger-nails of 464 persons has shown that splinter haemorrhages occur in many patients who are not suffering from bacterial endocarditis. They occurred in 44% of patients with uninfected mitral stenosis and also in about 15% of persons with other diseases. Our evidence suggests that these lesions are usually due to emboli in the terminal vessels of the nail-bed.

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