by digital compression while the tape was passed. The innominate was compressed while the tape was tied, but this failed to control the bleeding, as the wound was exactly at the bifurcation. Tapes had therefore to be applied to the common carotid and subclavian arteries to maintain haemostasis. Inspection then revealed the presence of an exit laceration of the posterior wall of the innominate artery just below the bifurcation. The wound was bathed with 2% sodium citrate solution and the anterior perforation closed with paraffined fine silk sutures on arterial needles. Suture of the more ragged posterior tear was more difficult, and after release of the tape on the carotid the posterior repair leaked: a piece of muscle was applied in support of the suture, but at the second attempt at release the vessel tore further and suture had to be abandoned. Resection of the bifurcation was therefore carried out after applying double ligatures of thick silk to the innominate, common carotid, and subclavian arteries; as a further precaution against the arterial spasm novocain was injected into the adventitia. Sulphathiazole cream was inserted into the wound, which was rapidly closed.

It was interesting to note that the blood pressure rose from 120 during the preliminary clearance of the vessels to 146, 160, and 184 mm. Hg during the successive ligations of the innominate, carotid, and subclavian arteries; while the pulse rate varied from 110 to 128, 150, and 160 during the corresponding phases.

No search for the foreign body was made. Blood transfusion had been continued throughout the operation and afterwards. Pulmonary oedema developed during the night, and the patient never regained consciousness, though he became very restless. Paralysis of the left side remained, but the right limbs moved. Reflexes were sluggish or absent. The right radial pulse was feebly detected on the following morning, but no temporal pulse was present.

Death occurred 16 hours after the operation; no post-mortem examination was obtainable.

Discussion

Cerebral symptoms, usually hemiplegia, followed in 29.6% of 27 cases of ligation of the common carotid artery for gunshot wounds in the last war (Makins, 1919) only 1 out of the 8 cases presenting cerebral symptoms returned to a normal state.

In the present case the bifurcation of the innominate artery was the site of the rupture; the cerebral symptoms began within five hours of the injury, and may therefore be ascribed to spasm of the carotid, aided presumably by some intramural clotting and by general anaemia and low blood pressure. The effect of low blood pressure in producing organic cerebral damage has been dramatically demonstrated by Poppen (1939), who found that if the blood pressure was corrected by intravenous transfusion before ligation of the anterior cerebral artery no prolonged coma resulted, whereas a fatal coma was inevitable if at the moment of ligation the pressure was subnormal. Babinski remarked that an obliterated artery is a sympathetic nerve and that it is better to divide a main artery than to ligate it in continuity. Leriche (1940) postulates "cross-road zones" at the bifurcation of the main arteries, at which sympathetic vasoconstrictor impulses are initiated; he advocates division of the vessel between ligatures and injection of a local anaesthetic into the periarterial sheath.

In the case now reported a lesion of the common carotid was thought most likely as, although the foreign body was behind the manubrium, damage to the innominate with survival was considered impossible; spasm of the carotid was obvious, but similar spasm of the subclavian supply zone was not detected. Relief of the carotid spasm and the prevention of reactionary haemorrhage were considered to warrant operative intervention.

The innominate artery has been tied on many occasions for aneurysm: Sir William Wheeler (1942) reported a case of ligation of this vessel for traumatic subclavian aneurysm in 1932, and estimated that up to 1942 there had been about 70 cases of ligation for aneurysm; Ballance (1921) reviewed 57 cases, with 19 recoveries. Wheeler (1932) advocated division of the inner two inches of the clavicle, together with partial division of the right upper quarter of the manubrium sterni with retraction of the clavicle upwards and to the left; in the present case a resection of the clavicle at the sternoclavicular joint afforded reasonable exposure. Wheeler used three catgut ligatures, but Reid (1934) preferred stout silk and disliked the presence of a third coapting ligature for fear of erosion of the vessel wall; in this he agreed with Halsted, whom he quotes at length concerning eleven essential points

in the technique of arterial ligation. For large arteries it is agreed that temporary compression before tightening the ligature is essential in order to prevent intimal rupture.

Experimental work by Isenberger and Carroll (1939) showed that pedicled muscle flaps wrapped around incised wounds of carotid and femoral arteries of dogs caused effective haemostasis and permanent healing, with patency of the vessel. The muscle was opposed to the wound in the artery for about ten minutes or sutured around as a cuff without stitching to the vessel wall: endothelial lining regenerated and thrombosis did not occur when living pedicle grafts of muscle were employed. It is therefore interesting to speculate whether such treatment would be justifiable in dealing with the lesion now described: but it seems likely that in the presence of a bullet-wound contusion and rupture satisfactory adherence of the graft would not be feasible, and clot formation had already started. The experimental conditions might not obtain in the severe through-and-through wound described, and the arterial spasm would not be relieved.

Summary

A patient temporarily survived a through-and-through gunshot wound of the bifurcation of the innominate artery, and spontaneous arrest of haemorrhage occurred.

Traumatic arterial spasm of the common carotid artery resulted in rapidly progressive contralateral hemiplegia, which demanded an attempt at operative relief.

Attempted arterial suture of the injured bifurcation having failed, it was necessary to perform triple ligation of the innominate, subclavian, and common carotid arteries to ensure haemostasis. Resection of the artery was performed to interrupt the sympathetic pathways.

A brief commentary on arterial ligation and resection is included, with special reference to ligation of the innominate artery.

REFERENCES

- Ballance, Sir Charles (1921). *Brit. J. Surg.*, **9**, 438.
Isenberger, R. M., and Carroll, M. C. (1939). *Surgery*, **6**, 265.
Leriche, René (1940). *Presse méd.*, **48**, 41.
Makins, Sir G. (1919). *Gunshot Injuries of the Blood Vessels*, p. 137, Bristol.
Poppen, James L. (1939). *Arch. Neurol. Psychiat.*, Chicago, **41**, 495.
Reid, M. R. (1934). *Surg. Gynec. Obstet.*, **58**, 287.
Wheeler, Sir W. I. de C. (1932). *Irish J. med. Sci.*, 6th s., 583.
— (1942). *British Medical Journal*, **2**, 422.

TUBERCULOSIS IN LONDON

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This brief note carries forward for another year the account given in an earlier issue (Daley and Benjamin, 1942) of the effect of the impact of war upon the incidence of tuberculosis in London. The statistics of the notifications of new cases in 1942 are as follows:

TABLE I.—New Cases of Pulmonary Tuberculosis notified in London (Administrative County), 1938-42

Age Group	1938		1939		1940 (a)		1941 (a)		1942 (a)		
	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	Ratio to 1938 (%)
0-4	105	0.42	76	0.40	60	0.53	104	1.64	101	0.73	174
5-14	228	0.42	161	0.39	103	0.55	198	1.74	223	0.95	226
15-24	1,484	1.52	1,353	1.43	1,130	1.42	1,150	1.89	1,210	1.97	130
25-64	3,262		2,917		2,592		2,631		2,548		
65+	224		236		202		250		225		
Not stated	2		24		18		24		26		
Total	5,305	1.31	4,767	1.26	4,105	1.33	4,357	1.87	4,333	1.80	137
Ratio to 1938 (%)	100		96		102		143		137		

(a) Excluding non-civilians.

TABLE II.—*New Cases of Non-pulmonary Tuberculosis in London (Administrative County), 1938-42*

Age Group	1938		1939		1940 (a)		1941 (a)		1942 (a)		
	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	Ratio to 1938 (%)
0-4	142	0.57	112	0.59	96	0.85	129	2.03	121	0.88	154
5-14	253	0.47	200	0.48	146	0.78	148	1.30	204	0.87	185
15-24	272	0.20	217	0.17	162	0.16	172	0.20	190	0.23	115
25-64	346		302		249		211		241		
65+	40		26		24		40		32		
Not stated	—		2		4		4		7		
Total	1,053	0.26	859	0.23	681	0.22	704	0.30	795	0.33	127
Ratio to 1938 (%)	100		88		85		115		127		

(a) Excluding non-civilians.

The rates for children are based upon small numbers, and too much importance should not be attached to the actual values, but it is clear that there has been improvement compared with 1941. It has to be borne in mind that in the latter part of 1941 and throughout 1942 the child population was augmented by returning evacuees, improved in health by their stay in the country. This movement probably increased the "exposed to risk" without proportionately increasing the number of new cases, and thus tended to reduce the case rate. The improvement cannot be attributed wholly to this factor, however, and it is probable that the actual risk of pulmonary infection was reduced by the substantial decrease in shelter life.

The incidence of new cases among adults continues to increase, but at a smaller rate. The undiminished pressure of war production, the effects of the black-out on ventilation, and the shortness of absence of holidays no doubt all contribute to the upward trend.

The tuberculosis mortality was considerably lower in 1942 than in 1941. The figures are shown below. Dr. Percy Stocks (1942) has already referred to the probability that the high mortality of 1941 has temporarily reduced the proportion of advanced

TABLE III.—*Deaths from Pulmonary Tuberculosis in London (Administrative County), 1938-42 (a)*

Age Group	1938		1939		1940		1941		1942		
	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	Ratio to 1938 (%)
0-4	30	0.12	15	0.08	22	0.19	41	0.65	22	0.16	(b)
5-14	25	0.05	16	0.04	24	0.13	25	0.22	17	0.07	(b)
15-24	459	0.77	447	0.83	454	0.95	432	1.16	376	1.05	136
25-64	1,863		1,922		1,965		1,827		1,534		
65+	213		250		222		227		215		
Total	2,590	0.64	2,650	0.70	2,687	0.87	2,552	1.10	2,164	0.90	141
Ratio to 1938 (%)	100		109		136		172		141		

(a) Non-civilian deaths excluded from outbreak of war.

(b) Differences 1938/42, having regard to small numbers of deaths, are not statistically significant.

TABLE IV.—*Deaths from Non-pulmonary Tuberculosis in London (Administrative County), 1938-42 (a)*

Age Group	1938		1939		1940		1941		1942		
	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	No.	Rate per 1,000	Ratio to 1938 (%)
0-4	88	0.35	64	0.34	64	0.57	92	1.45	56	0.41	(b)
5-14	59	0.11	38	0.09	42	0.23	62	0.55	28	0.12	(b)
15-24	66	0.06	75	0.06	75	0.08	73	0.09	66	0.10	167
25-64	113		103		109		99		103		
65+	21		22		28		17		30		
Total	347	0.09	302	0.08	318	0.10	343	0.15	283	0.12	133
Ratio to 1938 (%)	100		89		111		167		133		

(a) Non-civilian deaths excluded from outbreak of war.

(b) Differences 1938/42, having regard to small numbers of deaths, are not statistically significant.

cases within the tuberculous population, and that the mortality may be expected to rise again when the increased incidence of active disease which occurred in 1940-1 begins to influence the death rate.

REFERENCES

- Daley, W. A., and Benjamin, B. (1942). *British Medical Journal*, 2, 417.
Stocks, P. (1942). *Ibid.*, 2, 750.

Medical Memoranda

Trichlorethylene and Trigeminal Anaesthesia

Trichlorethylene in the form of trilene has proved to be a useful aid to successful anaesthesia. The following case reports of trigeminal anaesthesia after the administration of trilene are thought to be worth publication in view of the lack of reference to this complication.

CASE REPORTS

Case 1.—A married woman aged 32 was examined under anaesthesia and dilatation of cervix and curettage were carried out on May 17, 1943. Premedication was by omnopon gr. 1/3 and scopolamine gr. 1/150, given 1½ hours before operation. Anaesthesia was induced with N₂O and oxygen (McKesson). Trilene was added, using the CO₂-absorption technique. The induction and operation lasted 20 minutes. Recovery from the anaesthetic was without incident. There was neither sickness nor vomiting. Soon after awaking the patient complained of tightness of the skin of the face. The next day she found she could not eat her first solid meal. She was unable to feel the food in her mouth. The skin from the chin to near the crown of the head and from ear to ear was numb. The nose was "dry," and the eyes "felt screwed up and tearless." On Nov. 1 the anaesthesia of the face still persisted. The buccal anaesthesia was less. The corneal reflexes were absent. The nares were dry. The patient is now very well, but the numbness of the face is a "nuisance." Chewing is difficult, as she often bites the side of the mouth. The eyes "feel screwed up and fixed."

Case 2.—Hysterectomy was performed on June 17, 1943, on a woman aged 46. Premedication was by omnopon gr. 1/3 and scopolamine gr. 1/150, 1½ hours before. Anaesthesia was induced with nitrous oxide and oxygen (McKesson). Trilene was added, using the CO₂-absorption technique. As relaxation was poor, ethyl ether was substituted for the trilene. The induction and operation lasted nearly an hour. The patient recovered from the anaesthetic without incident except for some retching. She had a mild cystitis. On the second day after the operation she complained of stiffness of both lips, numbness about the mouth, and numbness of the tip of the tongue and the gums. Feeding was difficult. The numbness spread over the face, nose, and forehead. The eyes felt "as if they were closed and stiff." By Oct. 31, 1943, the anaesthesia of the face had improved somewhat. There was still numbness of the buccal mucous membrane: the corneal reflexes were absent; the nares were dry; and the patient talked with a slight lisp. She is quite well, but is very conscious of her disability.

Case 3.—A single woman aged 46 underwent ligature and injection of the saphenous veins on July 16, 1943. I had previously anaesthetized her twice with nitrous oxide and oxygen and once with ethyl ether by the endotracheal method. Before the operation on July 16 premedication with omnopon gr. 1/3 and scopolamine gr. 1/150 was given. Anaesthesia was induced with nitrous oxide and oxygen (McKesson). Trilene was added using the CO₂ absorber. The induction and operation lasted 30 minutes. It was not a "sweet" anaesthetic. The breathing was short and snappy. Cyanosis was evident. The patient's condition was perfectly satisfactory until she began to regain consciousness. She was violently sick, vomiting frequently for 3 days. She felt "completely knocked out," and had a "vile" headache, which lasted 3 weeks. Numbness of the face appeared immediately, and extended over the trigeminal area. The tip of the tongue and the buccal mucous membrane were insensitive. Feeding was very difficult, as fluid simply ran out of the mouth. Eventually the patient discovered she could feed herself by the aid of a mirror. There was loss of secretion in the nares. The eyes were dry, and the corneal reflexes were absent. On Oct. 21 the patient's condition had improved. She now eats in the normal way; lacrimation has reappeared; she talks with a lisp; and there is still no secretion in the nares. The face is numb, but she is sensitive to cold winds. Corneal reflexes are absent.

There is no doubt that the unfortunate sequela in each of the three cases is a bilateral trigeminal anaesthesia following on trilene administration. This view is supported by Prof. Geoffrey Jefferson, to whom I am indebted for examining Case 3. It is known that trigeminal anaesthesia from trichlorethylene has occurred previously (Langton Hower). My cases seem to support Striker's theory that in the treatment of tic douloureux with trichlorethylene the mitigation of the pain is due to a phase of analgesia. After several months these three cases show the same degree of residual symptoms—namely, numbness, loss of corneal reflexes, dryness of the nares, and lispings. It seems to