

THE SURGICAL USES OF OZONE.

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IN THE LANCET of Oct. 21st, 1916, a tabulated statement was given of 20 cases treated by ozone at the Queen Alexandra Military Hospital. Further cases are now recorded in the accompanying table.

Instructions for using ozone.—1. The accumulator should not be let down below $3\frac{1}{2}$ volts; if it is, the ozone (if any) produced will not be strong enough to produce satisfactory results. The accumulators should be tested daily with a voltmeter, and should be recharged every second day.

2. The coil should be examined daily to see if it is sparking properly and the binding screws of the "trembler" screwed up tight.

3. The production of ozone should be tested before each patient is treated. This is done by holding a piece of white blotting paper saturated with the test: Starch, 1.25 per cent.; pot. iod., 0.25 per cent.; water, 98.50 per cent.; before the nozzle of the ozone tube. A deep blue colour should be produced in two seconds.

4. After using the flexible tubes they should be carefully wiped and steeped in boiling water for two minutes and then placed in cold water till they are again required. Ozone should be passed through the tubes to cleanse them thoroughly inside.

5. Boiled water only should be used for dressing and cleansing the wounds, sinuses, &c. Solutions such as lysol, carbolic acid, saline, &c., destroy the ozone by offering a field for chemical action.

6. It is emphasised that ozone will disclose the presence of (a) dead bone; (b) foreign bodies; (c) septic deposits; and it is useless to suppose ozone can effect healing till these conditions have been dealt with by the surgeon. The sudden appearance of foetid pus is indicative of the existence of one of these conditions, and ozone should be continued to purify the discharge before any surgical operative steps are taken.

7. The usual changes that take place in the discharges are as follows: (1) Increase of pus; (2) decrease and disappearance of pus, which (3) is replaced by clear serum, which (4) eventually becomes reddish in colour.

8. It is reasonable to allow one week of treatment for every month of previous duration without healing, before healing can be expected.

9. The length of time for which the ozone is to be used depends on the size of the surface to be treated. The maximum time is about 15 minutes.

Table of Further Cases of Wounds, Sinuses, and Cavities Treated by Ozone.

M, months; W, weeks; D, days; Ap, applications; U.T., still under treatment; N.R., no result; Dec. Tr., declined treatment; R, removed.

No.	Nature of disability.	Previous duration.	Duration of treatment.	Result.	No.	Nature of disability.	Previous duration.	Duration of treatment.	Result.
21	Twice plated for fracture of femur. "Plate" acted as "foreign body."	—	—	N.R.	49	g.s.w. detaching all structures from brim of pelvis, leaving large cavity $4\frac{1}{2}$ in. deep, communicating with bladder.	16 m.	—	Conval.
22	Wound on instep, bell-mouthed sinus extending from dorsum to sole foot, 3 in. deep.	8 m.	3 m.	Healed.	50	g.s.w. r. leg, 3 sinuses $1\frac{1}{2}$ in. $\frac{1}{2}$ and 1 in. in depth.	10 "	—	Healed.
23	Sinus in stump 2 in. deep.	10 "	7 w.	"	51	Sinus in stump, $1\frac{1}{2}$ in. deep.	11 "	12 d.	"
24	Abscess cavity 3 in. deep, opening 4 by 3 in.	10 "	3 m.	"	52	Compound fracture of ulna, flexor tendons gangrenous, had to be cut away.	13 "	1 m.	"
25	Ulcer on front of leg, $1\frac{1}{2}$ in. long, 1 in. deep.	18 "	3 "	"	53	Suppurating cavity in groin, 1 by $2\frac{1}{2}$ in.	2 "	1 m.	"
26	X ray burn, ulcer $10\frac{1}{2}$ by 4 in.	12 "	—	"	54	Sinus in foot, $1\frac{1}{2}$ in. deep.	2 "	9 d.	"
27	Large surgical wound, 10 in. long, $2\frac{1}{2}$ in. deep, with inner opening leading to cavity in bone $2\frac{1}{2}$ in. deep.	15 "	3 m.	Healed.	55	Excision of elbow-joint, leaving sinus $1\frac{1}{2}$ in. deep.	12 "	—	"
28	Sinus on left side of lower jaw, $1\frac{1}{2}$ in. deep.	4 "	5 w.	"	56	Sinus in stump $3\frac{1}{2}$ in. deep.	23 "	9 d.	"
29	Sinus extending from horizontal ramus of lower jaw 4 in. long.	1 "	5 "	"	57	Two sinuses in upper part of thigh, outer sinus $2\frac{1}{2}$ in. deep, inner sinus $3\frac{1}{2}$ in. deep.	12 "	—	"
30	Compound comminuted fracture of upper third of left femur, causing sinus 3 in. deep.	17 "	6 "	"	58	g.s.w. sinus inner side of arm, leading down to bone, $3\frac{1}{2}$ in. deep.	2 y.	—	U.T.
31	Fracture of upper part of thigh, leaving sinus $2\frac{1}{2}$ in. deep, opening into cavity in bone, $\frac{1}{2}$ by $1\frac{1}{2}$ in.	13 "	3 "	"	59	g.s.w. r. arm, suppuration and sinus $1\frac{1}{2}$ in. deep.	14 m.	—	U.T.
32	Large wound on right side of face, 3 by $4\frac{1}{2}$ in. with deeper opening extending into mouth.	3 w.	1 m.	"	60	Sinus in thigh $2\frac{1}{2}$ in. deep.	9 "	6 w.	Healed.
33	Sinus and cavity in tibia $1\frac{1}{2}$ in. deep.	10 m.	15 d.	"	61	Sinus in buttock $2\frac{1}{2}$ in. deep, shell piece came away.	3 "	6 d.	"
34	g.s.w. leaving sinus in front of thigh $2\frac{1}{2}$ in. deep.	10 "	—	"	62	Sinus in left humerus 1 in. deep.	23 "	5 "	"
35	Sinus from inner angle of stump. Sinus from middle of stump 2 in.	10 "	3 w.	"	63	Surface wound after operation, a bell-mouthed sinus through forearm.	12 "	24 "	"
36	Sinus $3\frac{1}{2}$ in. deep below point of shoulder.	14 m.	—	U.T.	64	Wound from operation 1 by 3 in. and sinus down to humerus.	15 w.	6 w.	"
37	Sinus passing through middle part of thigh penetrating femur.	14 "	3 w.	Healed.	65	Bell-mouthed sinus over left external malleolus.	13 m.	2 m.	"
38	Sinus at point of chin, $1\frac{1}{2}$ in. deep.	1 "	8 d.	"	66	Empyema left side, profuse discharge of pus.	9 "	—	N.R.
39	g.s.w. L. thigh, operation for dead bone, leaving large surgical wound 4 by 4 in. One sinus in femur 1 in. in diameter, 1 sinus in soft tissues 1 in. in diameter, both 2 in. deep.	17 "	—	"	67	Bell-mouthed sinus in forearm.	5 "	1 m.	Healed.
40	Suppuration after enucleation of eye.	18 "	4 w.	"	68	Deep furrow in tibia 1 by 3 in. leading down to cavity in bone.	22 "	—	U.T.
41	Sinus 3 in. long extending from outer angle of flap.	10 "	5 d.	"	69	Suppuration in right lacrymal sac.	18 "	21 ap.	N.R.
42	Suppuration of socket after enucleation of eye.	6 "	5 w.	"	70	g.s.w. penetrating wound through calf.	6 w.	17 d.	Healed.
43	Sinus at inner aspect of stump 2 in. deep, running into a cavity 2 by 3 in.	23 "	12 "	"	71	Sinus and subcutaneous space right side of back of neck.	3 "	10 ap.	"
44	Compound comminuted fracture of forearm, incised wound with sinus leading down to ulna $1\frac{1}{2}$ in. deep.	4 "	3 "	"	72	Ulcer on external malleolus (right).	7 m.	3 m.	"
45	Ulcer on left chin.	2 "	6 d.	"	73	3 sinuses in left thigh.	14 w.	17 d.	2 out of 3 sinuses healed.
46	Surgical wound 10 by 4 in. for removing of plate from femur, with 2 sinuses.	1 y.	2 m.	"	74	Empyema left side, profuse discharge, very foetid. Cavity in lung.	2 m.	2 m.	Healed.
47	Suppuration in socket after removal of eye.	6 w.	4 d.	"	75	Two sinuses in right thigh: (1) $2\frac{1}{2}$ in. deep; (2) 2 in. deep.	2 y.	—	Dec. Tr.
48	Ulcer on cheek with actinomycosis.	4 m.	17 "	"	76	Sinus through arm double bell-mouthed.	4 m.	—	N.R.
					77	Sinus and cavity in lower jaw.	1 "	19 d.	Healed.
					78	Sinus in stump $2\frac{1}{2}$ in. deep.	5 "	—	R.
					79	Sinus in os calcis (right) $1\frac{1}{2}$ in. deep.	9 w.	9 d.	Healed.

Remarks.

Case 21.—Withdrawn from treatment for operation for 3 weeks.

Case 26.—Ulcer healed rapidly until half original size, when patient left hospital of own accord.

Case 31.—Ozone disclosed cavity in femur containing piece of shell $\frac{1}{2}$ by $\frac{1}{4}$ in. which came out without operation.

Case 32.—Wound extremely unwholesome and foetid but smell disappeared within 5 days of using ozone.

Case 36.—Ozone disclosed and X rays confirmed existence of several pieces of metal in and about sinus and on shoulder blade. Returned for operation.

Case 39.—Sinuses healed 1 month.

Case 41.—Examination showed streptococci before ozone. They completely disappeared after second application.

Case 44.—This case is awaiting plating of forearm.

Case 49.—Returned after operation Jan. 9th, operation Nov. 1st.

Case 50.—Ozone disclosed dead bone, which came away.

Case 55.—Transferred to Oxford at own request.

Case 58.—Returned after operation, Dec. 13th.

Case 59.—Returned after operation, Nov. 30th.

Case 67.—Transferred to Aldershot.

Case 69.—Returned for operation; lacrymal sac removed.

Case 72.—Returned for treatment after operation Dec. 13th.

Case 75.—Left of his own wish.