The Boston Medical and Surgical Journal

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June 1, 1922.

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Original Articles.

AVULSION OF THE SCALP. REVIEW OF THE LITERATURE AND THE REPORT OF A CASE.

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IN May, 1916, Miss I. C., aged 58, was caught by the hair in the revolving wheel of a shoe-stitching machine. Her entire scalp was torn off, as was also the upper part of both upper lids and the left ear, excepting the tragus, anti-tragus, and lobule. This left upper ear remained attached by a narrow pedicle posteriorly.

She was taken at once to a hospital in her home town where wet dressings were applied and hemostasis was effected. She did not lose consciousness at any time.

After nine weeks of wet dressings, a heterogenous Thiersch graft was transplanted to the

patient's vertex. This did not take. Reverdin autogenous grafts were then applied. This procedure was repeated about every ten days during the next three months, and most of these grafts took. In May, 1917, through June of same year, three plastic operations were done to relieve contractions of the eyelids. These operations consisted merely of lysis of scar without grafting.

She first entered the Massachusetts General Hospital in November, 1917. She then showed a head covered with a thin, shiny skin through which many blood-vessels showed and which was adherent to the skull and only slightly movable. The area of previous denudation extended from just below the eyebrows to just above the occipital protuberance. Laterally it reached to both ears. The left ear at its upper half was drawn back and bound down in scar tissue. Plastic operations were done by Dr. Porter on the ear and on both eyelids, restoring the former to its normal position and giving more freedom of movement to the latter. She was discharged, February 9, 1918.

It was noted during the time she was under observation that the scalp tended to intermittently lose considerable portions of skin from pressure or microbial invasion. The skin was tense and shiny, and by the middle of February, 1919, there were about a dozen areas, each about

Miss I. C.—Four weeks after the second trephining.

the size of a dime, which were superficially ulcerated and covered with a film of purulent material and crust.

In February, 1921, she again entered the hospital. The superficial ulcerations were increasing in number and the patient complained of a constant dull ache in her "eyeballs." Dr. Porter now made an attempt to get better vascularization of the scalp by drilling through the calvarium to the dura through five of the ulcerated areas in the frontal region. The skull was unusually thick and hard and there seemed to be no diploe. She left the following month and improved slightly for a while as regards the ulcerations, but entered the hospital again the following August, showing six large and ten small ulcerations. She now complained of a constant dull generalized headache and of a feeling of pressure so intense that she could not even bear to have her wig on. Eighteen holes about 1 cm. in diameter were now drilled as before, through the calvarium to the dura. There was very little operative reaction. During her convalescence her temperature occasionally rose to 100 F. One week after operation the headache had disappeared. In September she was discharged. The drill holes were irrigated with Dakin's, and healthy granulations soon appeared.

From that time until the first week in January, 1922, the scalp gradually healed. Each drill hole continued to suppurate until it dis-

Miss I. C.—Four weeks after the second trephining.

Ring of bone extruded from one of the frontal trephine holes.

charged a bit of necrotic bone, the necrosis resulting from the trauma of the drill used in the trephining. These pieces were sometimes complete bony rings. All previous symptoms have now disappeared and the patient declares she feels perfectly well. The scalp is almost completely healed and shows no tendency to break down.

Avulsion of the scalp occurs most often in women working in factories, whose long hair becomes caught in revolving machinery. There are five layers of the scalp—the skin, the subcutaneous fat, the epicranial aponeurosis, a layer of loose areolar tissue, and the pericranium. In cases of avulsion, the plane of separation is in the areolar tissue between the aponeurosis and the pericranium, and often portions of the pericranium are also torn away.

These cases may be treated by plastic oper-

ations or by skin grafting. Autogenous grafts are best, both Thiersch and Reverdin having fair success. The literature shows that the heterogenous grafts practically always fail, though Bevings⁵ reports success with one case. Occasionally, if the scalp is not entirely avulsed and has a sufficient blood supply, it may be sutured back into place.

Bevings found in the *Philadelphia Medical and Physical Journal* the report of an avulsion of the scalp, in 1777. In this case the surgeon in charge, named Vance, ordered multiple trephining of the skull, apparently to the diploe, for he stated that he used a shoemaker's awl and that the time to quit boring was "when a reddish fluid appeared on the point of the awl." He declared that "proud flesh appeared to rise in these holes, but that it skun over slow."

Mellish⁴ states that complete avulsion is sometimes attended with fatal hemorrhage and shock, and that the next danger is from infection.

A noteworthy feature is the length of time required to obtain healing. Gussenbauer had a case lasting for twenty months, owing to the continual breaking down of the cicatrices. Abbe, of New York, reported a case in which 12,000 grafts were planted in four years.

In 1915, Davison⁷ trephined a skull in order to obtain healthy granulation tissue to cover over an area where the pericranium had sloughed. He drilled to the dura. The bone beneath had begun to undergo necrosis, but at the same time granulations had appeared through the two parietal foramina and to a slight extent through the suture line between the two parietal bones. This suggested that if there were enough foramina, there would be enough granulation tissue to cover the surface. He therefore drilled about fifty holes through the calvarium. Granulations soon appeared through the holes and spread rapidly over the denuded area.

Robinson⁸ declares that the secondary breaking down of the healed areas occurs less often if the thick Wolfe-Krause grafts are employed. Grafts, he says, will grow readily on primary wound surface.

Davis⁸ reports two cases of avulsion, in one of which, four years after the accident, the patient was constantly bothered with a sensation of a heavy weight pressing on the top of her head. The other case was grafted unsuccessfully with pigskin and lambskin but was finally satisfactorily grafted according to the Thiersch method. There were marked hemorrhages in both his cases, but no shock in either.

Davis feels that the whole thickness grafts are the most satisfactory in the treatment of these cases. He gives some interesting historical data on avulsion, from which we quote rather freely. "The practice of scalping," he says, "was not uncommon among the Asiatics, Europeans and Africans, and is mentioned twice in

the Bible. The American Indians practiced scalping long before the advent of Columbus. The amount of scalp removed varied with the tribe.

"The first case of scalping due to machinery, recorded in medical literature, is that of Downs, which occurred on June 23, 1838. Netolitzki was the first to employ grafts in the treatment of scalping. . . ."

He then describes a series of experiments by Fouchard on the cadaver, from which he concludes that the tearing of the scalp is produced by a sudden violent traction, which is exerted obliquely from front to back, the superciliary ridges acting as the cutting instrument, and the skin is cut by them where it is the thinnest.

Davis, in 1910, summarized ninety-two cases of total avulsion and thirty cases of partial avulsion, totalling one hundred and thirty-two. He suggests the transplanting of hair-bearing skin in certain selected cases. With the Reverdin grafts, he thinks there is more likelihood of contraction than by Thiersch's method.

Law⁹ says that when the skull is laid bare there is frequently necrosis and exfoliation of the outer table, granulations forming in the vascular diploe and lifting up the thin layer of bone above. He reports the successful grafting of a granulating skull with amniotic membrane after drilling holes through the skull to the diploe.

In 1914 Müller¹⁰ reported a case of total avulsion and added eighteen others which had been collected by Myata and von Enz, thus bringing the total number of cases of avulsion up to one hundred and forty-one.

Exclusive of the cases reported by Davis, Müller, Myata, and von Enz, we have found twenty-six others in the literature.

Case 142. Byron, 1912, Calif. M. & S. Reporter, Vol. 8, p. 333.

Case 143. Kirmisson, 1912, Bull. et Mém. Soc. de Chir., Paris, Vol. 38, p. 164.

Case 144. Grondahl, 1912, Krist. Kirurg, p. 16.

Case 145. Northrop, 1912, Hahnemann Monthly, Vol. 48, p. 666.

Case 146. } through Painetvin, 1912, Bull. et Mém. Soc. de
Case 151. } Chir., Paris, Vol. 48, p. 25.

Case 152. Chepmell, 1913, Lancet, Vol. 1, p. 76.

Case 153. Scott, 1913, Railway Surg. Jour., Vol. 20, p. 54.

Case 154. Luxembourg, 1913, Münch. m. W., Vol. 60, p. 2759.

Case 155. Vorkuryeff, 1913, Khirurg. Arkh. Velya, Vol. 29, p. 379.

Case 156. Berárd, 1914, Lyon Méd., Vol. 122, p. 540.

Case 157. Flaherty, 1914, Ann. Surg., Vol. 59, p. 186.

Case 158. Gillette, 1914, N. Y. Med. Jour., Vol. 99, p. 1135.

Case 159. Law, 1914 (See above).

Case 160. Landry, 1914, N. Orl. M. & S. J., Vol. 67, p. 782.

Case 161. Nuzum, 1915, Journ. A.M.A., Vol. 64, p. 1238.

Case 162. Sheinberg, 1916, N. Y. Med. Rec., Vol. 90, p. 788.

- Case 163. Perthes, 1917, *Münsch. m. W.*, Vol. 64, p. 1340.
- Case 164. Durham, 1919, *Long Island Med. Journ.*, Vol. 13, p. 63.
- Case 165. Geinitz, 1919, *Beitr. z. Chir. Tüb.*, Vol. 123, p. 252.
- Case 166. Morone, 1919, *Clin. Chir. Milano N. S.*, Vol. 1, p. 918.
- Case 167. Schönbauer, 1920, *Wien. klin. Woch.*, Vol. 23, p. 180.

There have been nine cases of avulsion of the scalp at this hospital since 1872. In one case there was loss of consciousness for a short time. Several had pain immediately after the accident and one case cried out every time the dressings were done for several weeks. Periosteal defects were mentioned in two cases. Heterogenous grafts were used three times and were total failures. Autogenous grafts had more success as we came to the later periods, due to improvement in the technique. Thiersch and Reverdin were equally successful. In three cases, one or both eyebrows were torn off and in only two cases is a note made of hemorrhage. No mention is made of exfoliation of bone. One ear was partially torn off in two cases. Mention is made in only two cases of late retraction of the eyelids due to scar. In practically all the cases that were followed, there have been secondary ulcerations. Mention is made in only one case of headache occurring late, or of a sense of pressure. Though the literature mentions tetanus as a rare complication, this series had no serious infections. No plastic operations were attempted to cover the scalp, though some were employed to relieve contraction of the eyelids. In six cases, the scalp was completely avulsed. These six were all women who worked in factories and whose hair had been caught in revolving machinery. The three others were men who were injured, respectively, in a railroad accident, a fall from a scaffolding, and an elevator accident. With the men, the scalp was completely avulsed. Healing occurred in all three cases without grafting, though one of these cases was complicated by considerable sepsis. In the case of two of the women, the scalp was replaced, but in both instances it sloughed and grafts had to be employed. Wolfe grafts were apparently not attempted. There was one death in the series from pulmonary embolism and one case gave the picture of shock.

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- ¹ Haubold: *Jour. A.M.A.*, vol. 48, p. 1429.
- ² Keen: *Surgery*, vol. 1, p. 892.
- ³ Durham: *L. I. Med. Journ.*, vol. 13, p. 2.
- ⁴ Mellish: *Ann. Surg.*, vol. 40, p. 644.
- ⁵ Bevings: *Phil. Med. Journ.*, vol. 9, June 7.
- ⁶ Robinson: *Surg., Gyn., and Obst.*, vol. 7, p. 633.
- ⁷ Davison: *Jour. A.M.A.*, vol. 70, p. 1368.
- ⁸ Davis: *Ann. Surg.*, vol. 52, p. 721.
- ⁹ Law: *Surg., Gyn., and Obst.*, vol. 19, p. 229.
- ¹⁰ Müller: *Beitr. z. Klin. Chir. Tüb.*, vol. 94, p. 10.

TRAUMATIC OSTEITIS OF THE WRIST.

BY MARK H. ROGERS, M.D., BOSTON.

THERE is a condition that involves one of the carpal bones of the wrist, either the semi-lunar or the scaphoid, which has not yet received sufficient attention so that it is known under any one name. This condition seems to be a very definite entity and has been described by two observers in careful and complete detail, namely, Preiser¹, who reports five cases in 1910, and Guie², who reports seven cases in 1914. Guie also reports 29 cases from other clinics, and gives a good bibliography, but the bibliography deals with other conditions of the wrist such as fracture. I have not met with any literature on the subject since that date, so that probably very few observations have been made. Kellogg Speed mentions the subject in his textbook on fracture, and this is about the only textbook that does call attention to it.

Preiser calls the condition a rarefying osteitis of an isolated carpal bone, and believes that it is the result of trauma. When he was studying the subject he made careful observations concerning the anatomy of the carpal bones, especially in relation to the nutrient artery, and he believes that a slight injury may block the nutrient artery and cause the absorption of the bone, which is the most prominent pathological condition. Guie considers the condition as essentially a compressed fracture, which is not recognized at first, with the secondary absorption of bone structure. This is somewhat analogous to a compressed fracture of the spine, or the so-called Kümmell's disease, in which the symptoms develop late and in which the x-ray shows a loss of substance of the cancellous bone six months after the original injury.

Two x-ray reports have suggested a similarity of this condition with the well-known Kohler's disease of the scaphoid of the foot in the x-ray findings, but Kohler's disease is confined to children and tends to normal recovery, while this condition is evidently most common in young adults, and probably does not recover spontaneously.

This condition is often mistaken and treated for such condition as tuberculosis, infectious arthritis or, if there is a traumatic history, fracture. The gradual onset without a clear-cut etiological background, and an x-ray that suggests a destructive process, certainly would lead one to consider tuberculosis as a very possible condition. Without a knowledge that there is such a condition as here described, it is certainly reasonable to suppose that we are dealing with a destructive bone disease. A case was recently examined, who had had two operations on the wrist, with removal of a semilunar bone, and a secondary operation for