

Blood and Urinary 17-Hydroxycorticosteroids in Patients with Severe Burns*

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INTRODUCTION

IT HAS BEEN reported by Wight *et al.*,⁹ Evans and Butterfield,² and others that the circulating eosinophils are depressed immediately following severe thermal injury, and begin to rise the third to seventh day after the burn. A marked eosinophilia is reported in the second to fourth month by the first authors. Evans and Butterfield² studied urinary corticoid excretion in four patients with 19 to 30 per cent body burns. Using a technic which measures only the unconjugated corticosteroids in the urine, they found elevated levels following burns in these patients. Recently, Moore *et al.*⁶ reported one case with a 22 per cent second degree burn in which there were no changes in the excretion of conjugated urinary 17-hydroxycorticosteroids following the burn. The patient had a normal increase in urinary corticosteroid excretion following the administration of ACTH one month after the burn. Wilson *et al.*¹⁰ have studied the urinary corticoid excretion in 12 patients with burns. They reported that the excretion of corticoids was sharply increased following a burn of significance, and remained elevated or at a normal level throughout the course of the burn regardless of whether the patient eventually died or recovered.

No studies are at present available on blood corticosteroid levels in the severely burned patient.

* The opinions or assertions contained herein are those of the writers and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

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It is the purpose of this paper to present studies of blood and urinary corticosteroids in 26 patients who simultaneously suffered severe thermal injury.

The explosion and fire on the aircraft carrier Bennington occurred early in the morning on May 26, 1954. Most of the men who were injured in this accident were transported to the U. S. Naval Hospital at Newport, Rhode Island. Blood and urinary specimens for corticoid determinations were obtained on 26 of the men who were burned in this fire beginning on the fourth day after the burn.

METHODS

Twenty-six patients were followed from the fourth to the fiftieth post-burn day. The ages of these men ranged from 19 to 47, with an average age of 24. Fourteen of the patients received cortisone or hydrocortisone, usually from the first to the fifth post-burn day, and ACTH, usually from the second to the sixth post-burn day. No hormones were given after this time. The dosage of cortisone and ACTH varied within the general ranges shown in Table I. No correlation was discernible between dosage and effect, the apparent differences occurring between that group which did not receive cortisone and ACTH and the one which did. Twelve patients received no hormone therapy.

Blood samples were drawn in the morning, usually from the femoral vein but sometimes from the antecubital vein. The blood was heparinized, centrifuged and the

TABLE I. *Dosage Range of Cortisone and ACTH Given to the Patients Who Received Hormone Therapy.*

Post Burn Day	Cortisone MGM/24 hrs.	ACTH Units/24 hrs.
1.....	0-300	
2.....	100-300	0-40
3.....	50-300	40-80
4.....	25-150	80-120
5.....	25-75	120
6.....	0-25	0-120

plasma was immediately withdrawn and frozen. The frozen plasma was flown daily by Navy plane to the Naval Medical Research Institute at Bethesda, where the 17-hydroxycorticoid measurements were carried out.

Most of the patients were on constant urinary drainage *via* urethral catheter from the first through the eighth to thirteenth post-burn days. After the catheter was removed, the voided urine was emptied into a large bottle which was kept under each patient's bed. The urine was allowed to stand at room temperature from one day to the next, and was collected each morning. It was measured, and an aliquot was frozen and flown to Bethesda for analysis. Urinary corticoid excretion was measured in 25 of the 26 patients. Collections were discontinued at the thirty-first day because of the

difficulty of obtaining accurate collections after this time.

The 17-hydroxycorticoids in the blood were determined by the method of Nelson and Samuels.⁷ The urinary 17-hydroxycorticoids were determined by the method of Glenn and Nelson.³

RESULTS

The patients in this series all had flash burns, and some had clothing and flame contact burns as well. The burns were largely second degree. Only six of the patients in this study had significant percentages of third degree burn. Two of these patients died. Of the remaining four, two received cortisone and ACTH and two did not. The burn percentages of all the patients in this study are shown in Table II.

BLOOD CORTICOIDS

During the period of the fourth to the fiftieth post-burn day, none of the patients in this study showed subnormal blood 17-hydroxycorticoid levels at any time. (Normal values were taken to be between 3 and 28 micrograms per cent). Two of the patients with extremely severe burns died while they were under study. Both of them had received cortisone and ACTH according to the schedule described above. One

TABLE II. *The Ages and Extent of Burn of the Patients in This Study.*

Patients Not Receiving ACTH or Cortisone				Patients Receiving Cortisone and ACTH					
		Percent of Body Burned				Percent of Body Burned			
		Age	Total Burn Deg.			Age	Total Burn Deg.		
1. Over 45% Burns..... Slow Convalescence	G. L.	28	61	4	1. Very Severe Burns.... Died	F. W.	36	99	54
	H. P.	23	68	30		A. Ro.	—	81	60
	S. W.	30	46	9	2. Over 45% Burns..... Slow Convalescence	F. L.	27	63	6
2. Over 45% Burns..... Good Recovery	J. C.	29	60	7	L. G.	20	66	5	
	J. R.	21	50	2	3. Over 45% Burns..... Significant Amount of 3rd Degree	W. H.	19	65	30
3. Less Than 45% Burns	R. B.	19	26	0	D. S.	20	45	13	
	W. J.	19	17	1	4. Over 45% Burns..... Good Recovery	J. B.	47	51	0
	H. D.	18	41	1	D. K.	19	48	3	
	C. H.	34	18	7	G. R.	19	61	2	
	W. Jo.	19	15	3	W. D.	27	57	0	
	J. M.	26	17	0	5. Less Than 45% Burns	M. G.	20	24	0
R. M.	—	27	0	R. B.	19	30	4		
				T. L.	21	26	2		

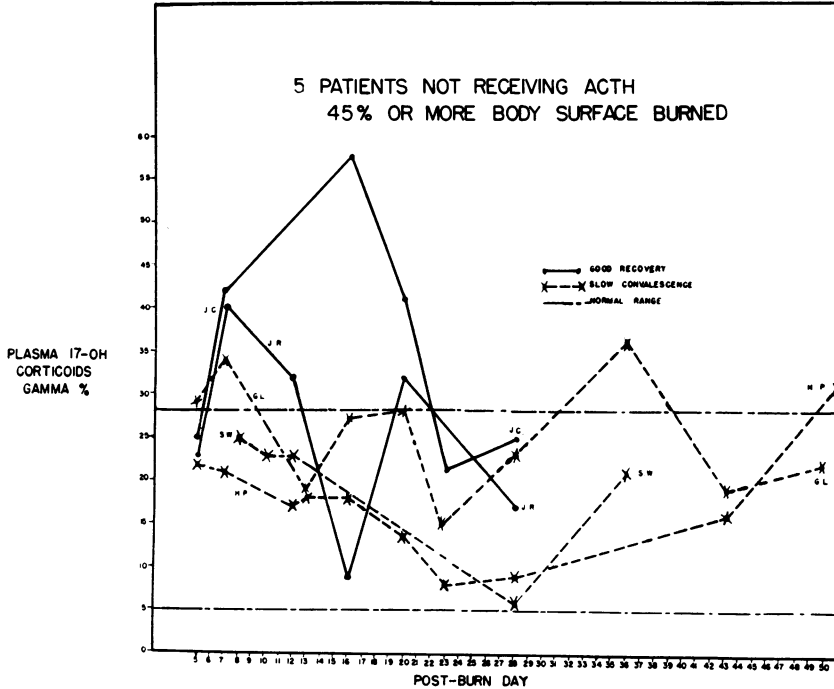


FIG. 1. Patients S. W., H. P., and G. L. were the sickest patients in this group. Patient H. P. was the most severely burned of all, with 68 per cent total bur of which 30 per cent was full thickness. In Figs. 1 to 4 the line representing the lower limit of normal should have been drawn at the 3.0 mg. % level instead of 5.0 mg. %.

of the patients died on the ninth, and the other on the fifteenth post-burn day. Both developed extremely high blood 17-hydroxycorticoid levels, reaching a peak of 230 micrograms per cent in one patient, and 104 micrograms per cent in the other.

THE GROUP NOT RECEIVING CORTISONE OR ACTH

1. *Patients with 45 per cent or more of the body surface burned.* The blood corticosteroid values obtained in five patients in this group are shown in Figure 1. It may be seen that all values obtained were in or above the normal range. Patients J. R. and J. C. had severe second degree burns, with small third degree components. Both made rapid recoveries. Patient G. L. also had a severe second degree burn with a small third degree component. His convalescence was complicated by septicemia. These three patients tended to have corticoid values in

one early convalescent period which were above the other two in one group. Patients S. W. and H. P. had significant percentages of third degree burn, and were the sickest patients in the group. Patient S. W. had a 46 per cent total burn with 9 per cent full thickness, while H. P. had a 68 per cent total burn with 30 per cent full thickness. Neither of these patients showed any values above the normal range. In this group of five patients, ten of 37 values were above the normal range.

2. *Patients with less than 45 per cent of the body surface burned.* The blood corticosteroids for seven patients in this group are shown in Figure 2. Only three of the 36 values in this group were above the normal range. None were below. There doesn't appear to be any correlation between the severity of the burn and the level of blood corticosteroids in the patients within this group.

TABLE III. *The Mean Plasma Corticoid Values and Urinary Corticoid Excretion Seen in Patients in Various Categories during the 4th-16th Day after the Burn.*

	No hormones		Cortisone and ACTH 1-6 day	
	Urine mg. 24 hrs.	Plasma mg. %	Urine mg. 24 hrs.	Plasma mg. %
1. Very Severe, Died*.....	—	—	35.3	125
2. Severe, Complicated Slow Recovery.....	19.0	27	15.5	60
3. Severe, Significant 3rd degree, Slow Recovery..	14.6	21	13.0	21
4. Severe, Good Recovery..	14.7	30	13.6	30
5. Less than 45% burn.....	8.3	22	13.0	19

*One patient died 9th day, one the 15th day.

THE GROUP RECEIVING CORTISONE AND ACTH

1. *Patients with 45 per cent or more of the body surface burned.* Two of the patients in this group died, as mentioned above. One, F. W., had a 99 per cent total burn, with 54 per cent third degree. The other, A. R., had an 81 per cent total burn, with 60 per cent third degree. Both had very high blood corticosteroid values (Fig. 3). Patient F. W. was found to have destruction of the right adrenal by hemorrhage at postmortem, which may account for the decline in his blood corticosteroid levels shortly before death.

Of the eight patients with 45 per cent or more of the body surface burned who lived, the three most severely burned were F. L., L. G. and W. H. All of these patients had over 65 per cent total burns, although only one, W. H., had a significant third degree component (30 per cent). The first two of these three patients tended to show somewhat higher blood corticoid values than the rest of the group. Patient W. H. and patient D. S., the two patients with the greatest amount of full thickness burn, tended (except for one isolated measurement), to show lower values. In this group of ten patients, 28 of 59 determinations were above the normal range.

2. *Patients with less than 45 per cent of the body surface burned.* Only two of 19 determinations in this group were above the normal range. None were below. These relationships are illustrated in Figure 4.

URINE 17-HYDROXYCORTICOID LEVELS

Urinary 17-hydroxycorticoids were determined in 25 of the 26 patients. Twenty-two of the 25 patients demonstrated elevated 24 hour urinary corticoid secretion on two or more occasions in the convalescent period from the fourth to the fifteenth post-burn day. (The normal range was taken to be from four to 11 mg. per 24 hours.) Of the three remaining patients, one had no measurements made before the eighth day, and the second had none before the tenth day.

TABLE IV. *Patients Showing Markedly Elevated Blood Sodium Levels after the Third Post-burn Day.*

Patient	Day Post Burn	Blood Na mEq/L	Urinary Na Excretion mEq/24 hrs	Blood Corticoid Level Gamma %	Urinary Corticoid Excretion mgm/24 hr	% Burn		Received Cortisone and ACTH
						2nd deg.	3rd deg.	
J. C.....	7	151	19	42	15.6	60	7	0
W. D.....	7	157	45	33	33.0*	57	0	+
D. K.....	8	157	57	49	9.1	48	0	+
F. L.....	6	165	—	75	12.2	63	5	+
H. P.....	7	151	53	21	8.0	68	40	0
F. W.....	7	179	53	92	20.0	99	54	+
R. O.....	7	190	—	224	31.3	81	60	+
C. H.....	7	160	—	20	4.1*	18	1	0
G. R.....	7	154	53	22	22.4*	61	1	+

All values shown for a single patient were obtained on the same day, except for the three urinary corticoid values marked by an asterisk (*), which were obtained one day before or after the stated day.

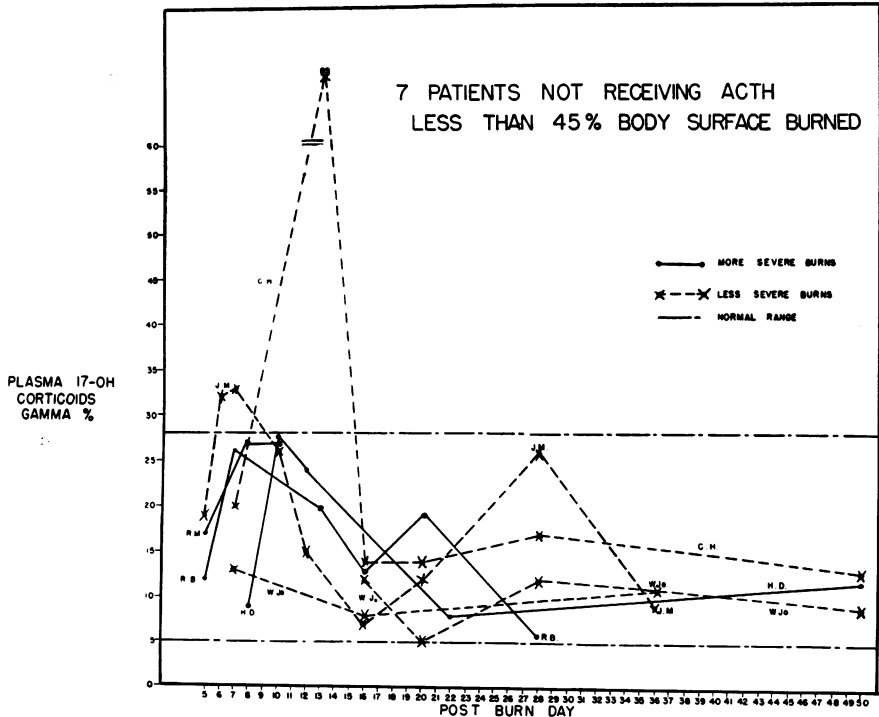


FIG. 2. The patients in this group tended to have plasma 17-hydroxycorticosteroid levels within the normal range, except for three isolated elevated values.

The third patient, while having measurements made from the fourth day on, showed only one elevation above normal on the fourteenth day.

THE GROUP NOT RECEIVING CORTISONE OR ACTH

1. *Patients with 45 per cent or more of the body surface burned.* The urinary corticoid output for the patients in this group during the fourth to fifteenth day is illustrated in Figure 5. The patients with a greater amount of third degree burn and more prolonged convalescence tended to show a somewhat greater urinary excretion of corticoids than those with a rapid convalescence. This is just the reverse of the relationships seen in the plasma corticoid levels. Patients H. P. and S. W. both showed several values for urinary corticoid excretion which were above normal, although neither patient had any plasma corticoid values above normal during this period.

2. *Patients with less than 45 per cent of the body surface burned.* The urinary corti-

cid output for the patients in this group tended to be lower than that seen in the patients with more severe burns (Fig. 6).

THE GROUP RECEIVING CORTISONE AND ACTH

1. *Severe burns with fatal outcome.* The urinary corticoid excretion was very high in these two patients until renal failure supervened in the terminal stages (Fig. 7).

2. *Patients with 45 per cent or more of the body surface burned.* All patients in this group showed rather high levels of urinary corticoid excretion (Figs. 7 and 8).

3. *Patients with less than 45 per cent of the body surface burned.* The urinary corticoid values in this group were also elevated (Fig. 6).

An over-all summary of average urinary and plasma corticoid levels may be seen in Table III. Of interest is the suggestion that in the group receiving no hormone therapy, the more severely burned, complicated cases tended to have lower blood values and higher urinary excretion than the

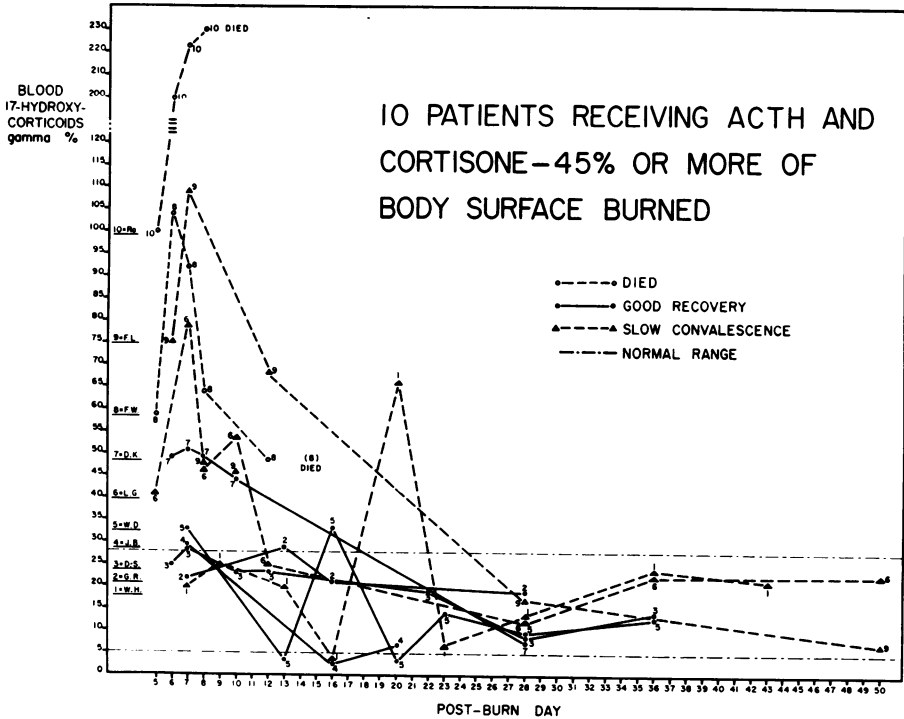


FIG. 3. The patients in this group received cortisone in most instances from the first to fifth post-burn day, and ACTH in most instances from the second to sixth day. Patient R. O. (10) died on the ninth day, and patient F. W. (8) died on the fifteenth day. Both had very high blood corticoid levels. Patient W. H. (1) was the most severely burned surviving patient in this group (65 per cent total, 30 per cent third degree), and with patient D. S. (3) represented the only significant third degree burns among the survivors.

severely burned patients who had largely second degree burns and recovered rapidly.

It may also be noted (Fig. 5) that the severely burned patients who received no hormone therapy continued to show elevated urinary corticoid excretion as long as two weeks after the burn.

It was not uncommon to note that plasma levels (free corticosteroids) were high, while urinary corticoid excretion (largely conjugated) was low (Fig. 8). A better idea of the over-all corticoid patterns in burns will undoubtedly be achieved when blood conjugates are measured as well.

SECONDARY TRAUMA IN THE CONVALESCENT PERIOD

Sixteen patients had skin grafting procedures in the convalescent period. Most of these operations represented minor trauma.

Blood steroids were not obtained until 24 to 48 hours after the operative procedure, and by this time the values, if they had been elevated, had returned to their preoperative levels. The one exception to this was patient J. C., who still had a blood level of 57 gamma per cent the morning after a skin grafting procedure.

Of the 16 patients who were subjected to grafting, eight were operated upon after urine collections had been stopped, or were incomplete for some other reason. Of the eight patients in whom measurements were made, urinary corticoid excretion was elevated for 24 hours postoperatively in six patients, and was not elevated in two. One of the patients, H. P., who failed to show an elevated urinary corticoid secretion following the skin graft, was in relatively poor condition with a 68 per cent burn, of which

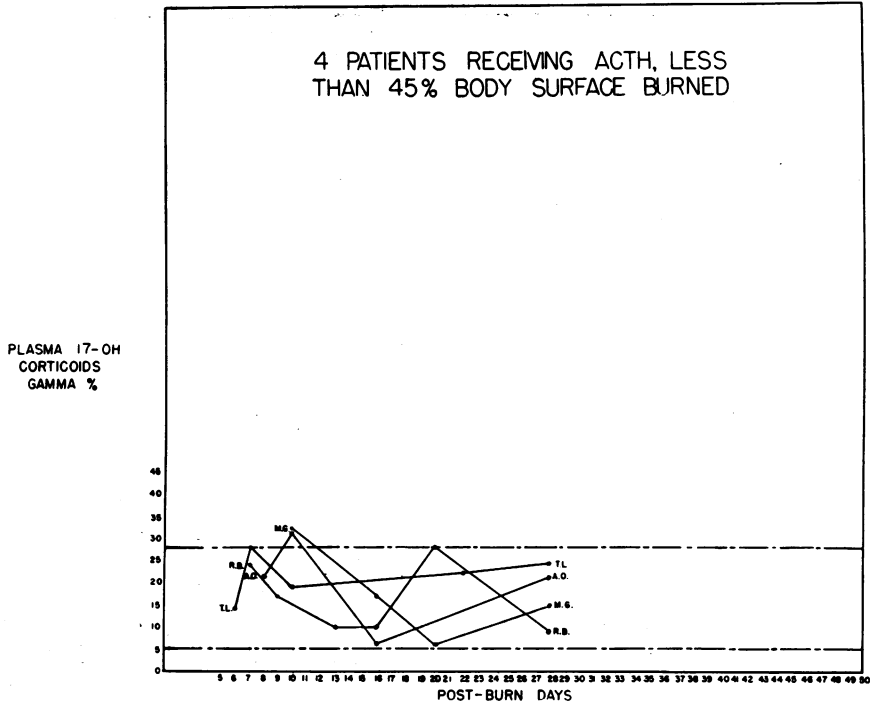


FIG. 4. Patients in this group received cortisone and ACTH in the immediate post-burn phase, tapering off by the sixth post-burn day. Almost all values are within the normal range.

PATIENTS NOT RECEIVING CORTISONE OR ACTH

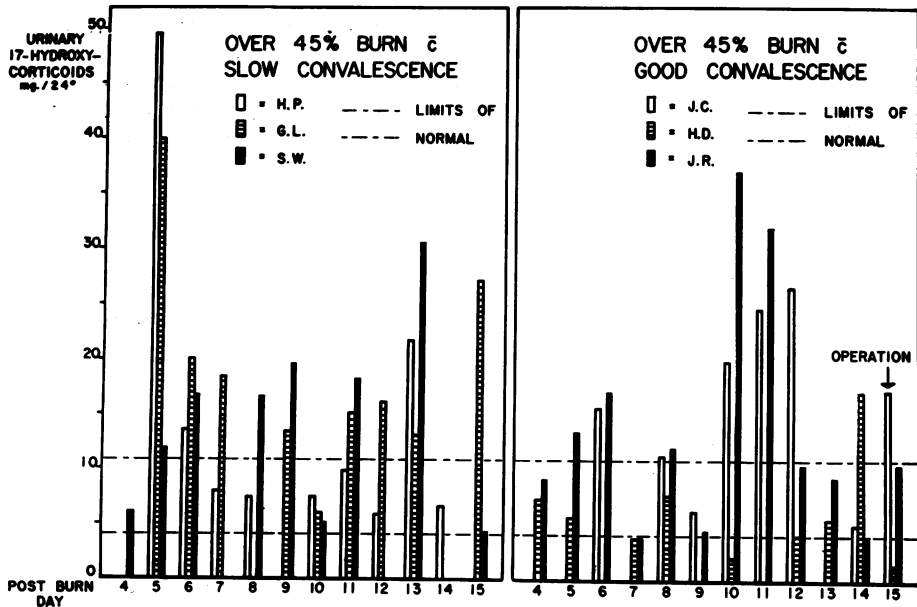


FIG. 5. Urinary corticosteroid secretion from the fourth to fifteenth day. See text for explanation.

30 per cent was third degree. He had a show a response to a skin graft on the tracheotomy and septicemia. He failed to twenty-seventh day. The second patient had

PATIENTS WITH BURNS OF LESS THAN 45% OF THE BODY SURFACE

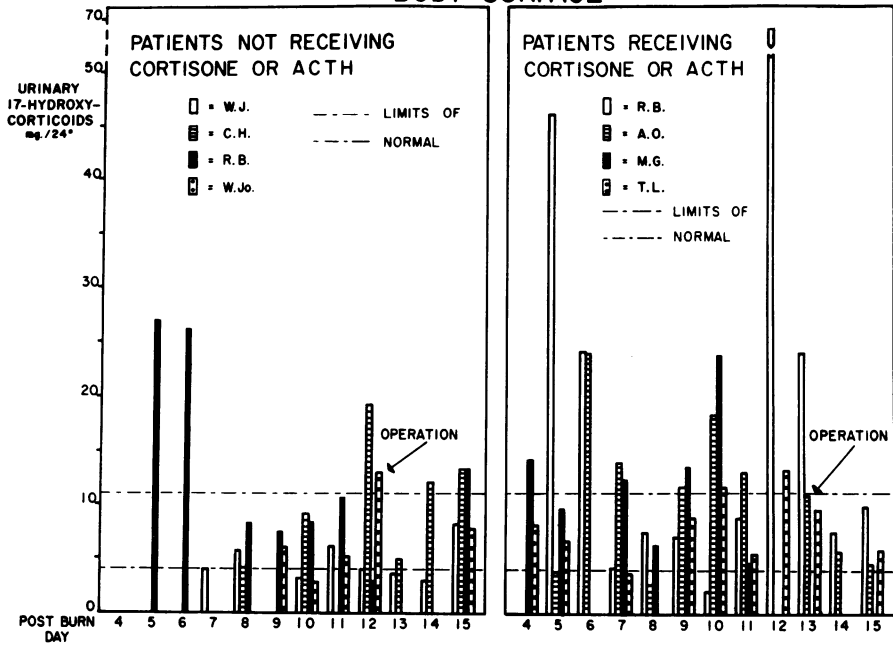


FIG. 6. Urinary corticosteroid secretion from the fourth to fifteenth day. See text for explanation.

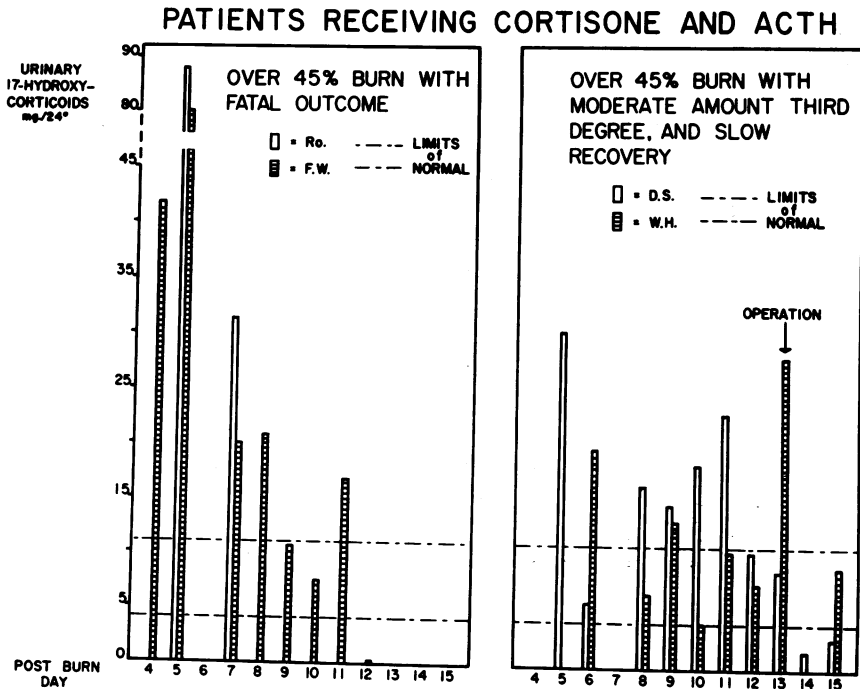


FIG. 7. Urinary corticosteroid secretion from the fourth to fifteenth day. See text for explanation.

PATIENTS RECEIVING CORTISONE AND ACTH

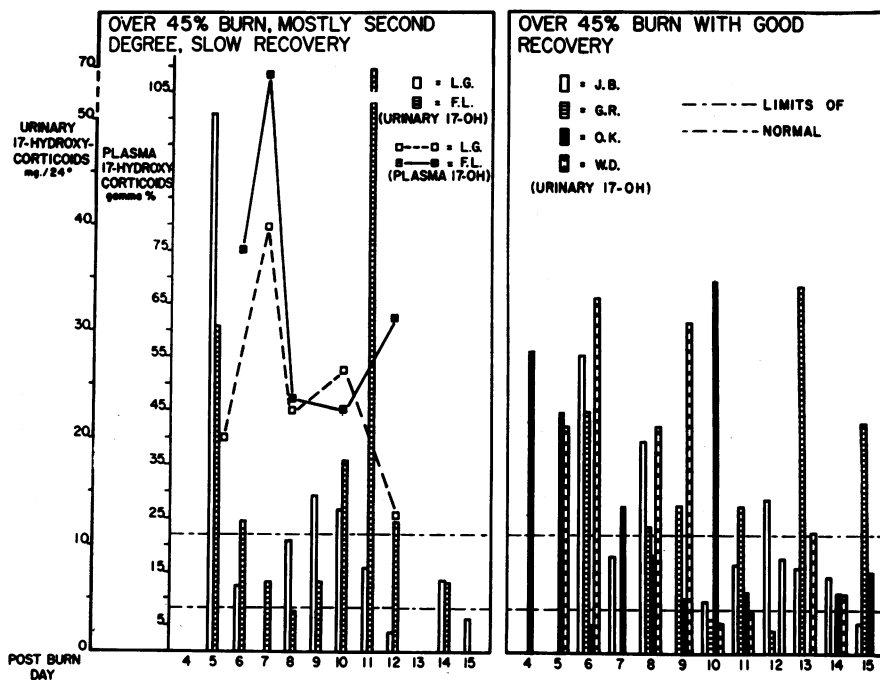


FIG. 8. Urinary corticosteroid secretion from the fourth to fifteenth day. See text for explanation.

a very minor operative trauma. Values for urinary corticoid excretion for three patients operated on in the convalescent period are shown in Figure 9.

BLOOD AND URINARY ELECTROLYTES

Blood and urinary sodium and potassium values were obtained in 22 of the 26 patients. Only three of the 22 failed to show two or more elevated blood sodium levels (above 147 mEq per liter). Three of the eight patients in the group who did not receive ACTH had two or more values over 152 mEq per liter. Six of the 14 patients in the group who received ACTH had two or more values over 152 mEq per liter. Seven of the nine patients showing marked hypernatremia had elevated blood or urinary corticoid levels during the period of hypernatremia.

The high blood sodium levels were probably due in part to fairly high levels of

intravenous saline administration coupled with the fact that the skin exudative losses were small due to the largely second degree character of the wounds, and the use of open treatment, which kept the wounds relatively dry. The insensible water losses were unduly large as a consequence of the very hot weather. These factors combined to produce dehydration, plus a relatively large intake of sodium with minimal sodium losses. The increased secretion of adrenal cortical hormones probably played a part in the sodium retention as well. The blood sodium levels in the nine patients with the greatest degree of hypernatremia are shown in Table IV. Urinary sodium excretion, burn per cent, blood corticoid values, and urinary corticoid excretion are also shown.

An attempt was made to see if any correlation could be established between the blood corticoid levels and the severity of the burn. It has already been shown in Fig-

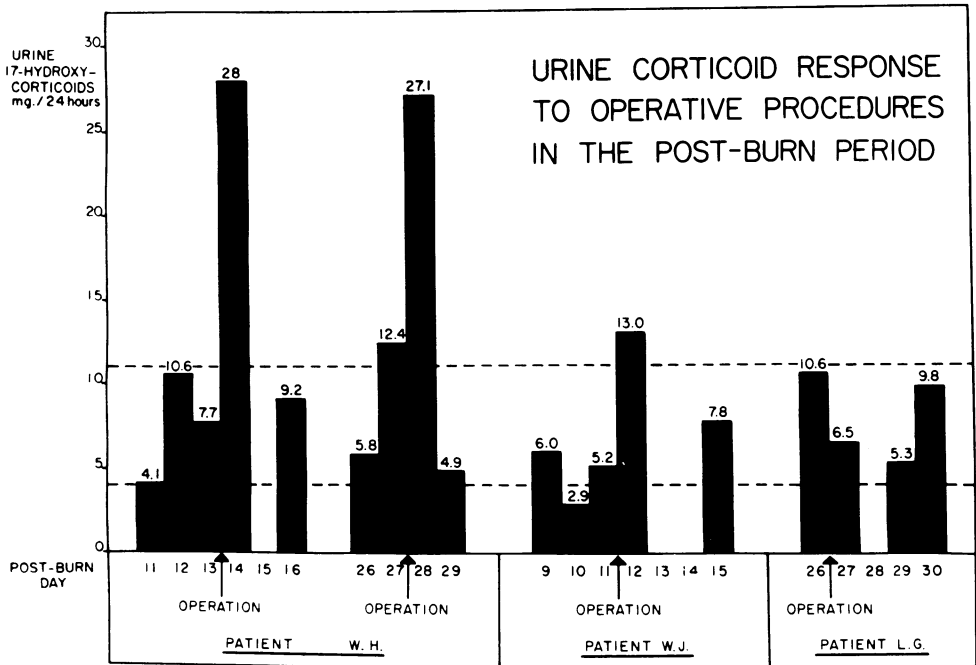


FIG. 9. Patient W. H. had a 65 per cent total burn with 30 per cent third degree. He received cortisone the first to fifth day, and ACTH the second to sixth day. On two occasions after the burn he had skin grafting procedures which were followed by significant increases in urinary corticoid excretion for a period of 24 hours. Patient W. Jo. had a 15 per cent total burn with 3 per cent third degree. An increase in corticoid excretion followed a skin grafting procedure on the twelfth day. Patient L. G. (66 per cent total, 5 per cent third degree) received cortisone the first to fifth day and ACTH the second to sixth day. He was in good general condition and failed to show corticoid response to very minor grafting procedure on the twenty-seventh day.

ures 1 to 4 that the patients receiving cortisone and ACTH tended to have higher peaks of blood corticoid levels than those who did not receive cortisone and ACTH. However, both in the group receiving ACTH and that in which ACTH was not given, there were some patients who showed blood corticoid levels above the normal range, while others showed simply high normal levels. A summary of the blood corticoid determinations is shown in Figures 10 and 11. The patients were divided into the groups described below, and their average values were plotted. On some days there may have been a value on only one patient in a group. In Figure 10, average values for the patients receiving cortisone and ACTH are shown. The following curves are charted: (1) The highest peak seen in

severely burned patient who died. (The second patient who died had hemorrhagic destruction of one adrenal, and hence is not included in this diagram.) (2) The next highest values were seen in patients with over 45 per cent body burns, largely second-degree, associated with slow convalescence. (3) The next highest values were seen in patients with over 45 per cent of body surface burned, largely second degree, with good convalescence. (4) The next highest (high normal) values were seen in patients with over 45 per cent burns, with a significant amount of third degree. (5) The lowest values were seen in patients with less than 45 per cent of the body surface burned.

In Figure 11 the average values for patients not receiving cortisone or ACTH are shown. The following groups are plotted.

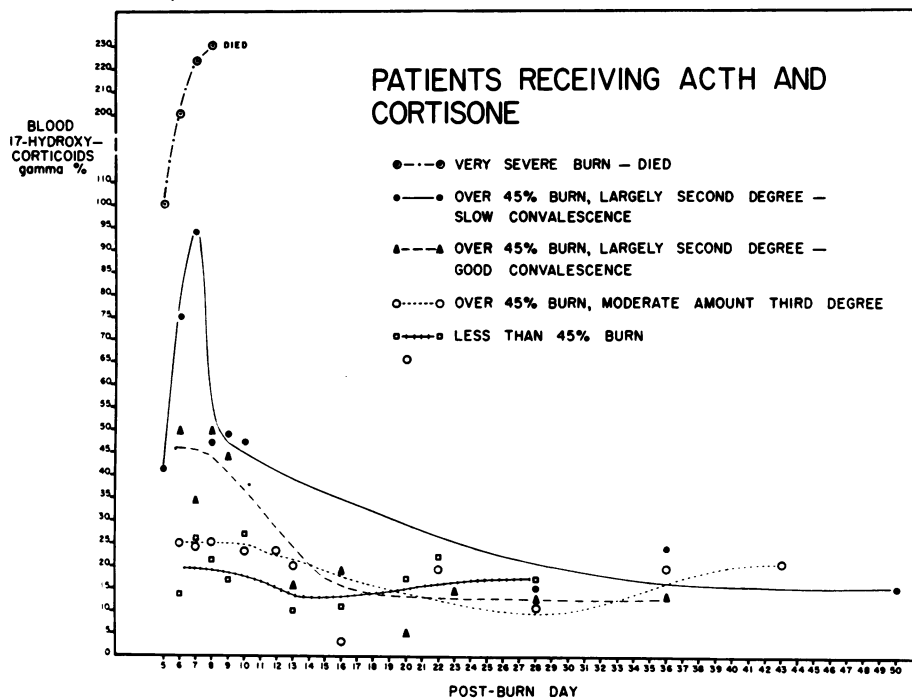


FIG. 10. General trends within indicated groups of patients who received cortisone and ACTH for the first six post-burn days.

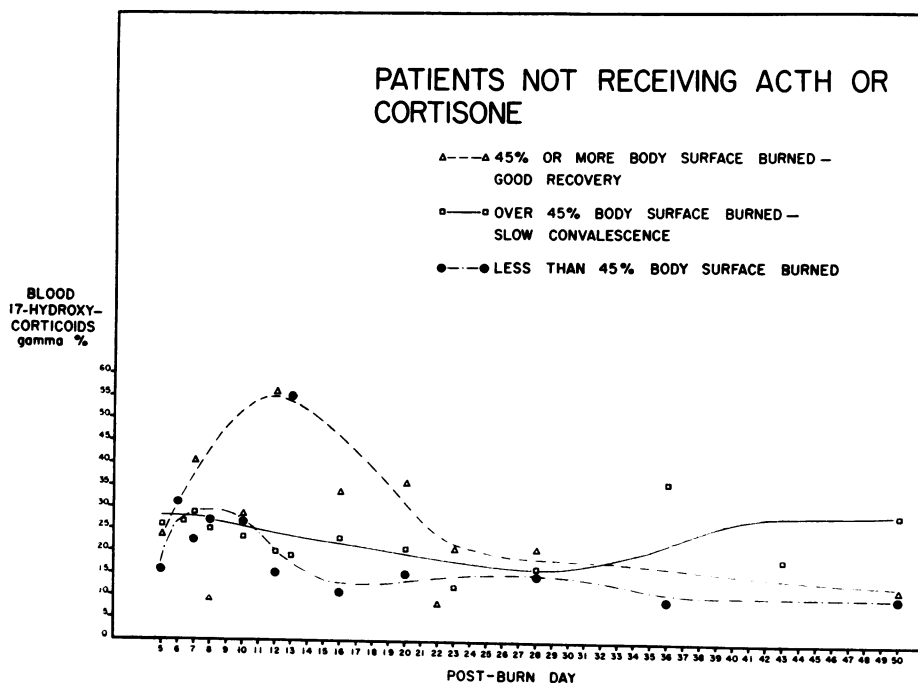


FIG. 11. General trends within indicated groups of patients who received no hormone therapy.

(1) Patients with over 45 per cent body surface burns, largely second degree, associated with a good convalescence. These patients demonstrated the highest values. (2) Patients with over 45 per cent body surface burns (two of the three with significant amounts of third degree burn) who had a slow and complicated convalescence. This group tended to show high normal or slightly elevated values throughout. (3) Patients with less than 45 per cent burns. This group showed the least marked corticoid response, and differed from Group 2 in that the corticoid values returned to the mid-normal range by the sixteenth day, whereas the patients in Group 2, with more complicated and severe burns, continued to show high normal or slightly elevated values.

DISCUSSION

In this group of 26 patients studied in the convalescent period from the fourth to the fiftieth day after burning, there was no evidence of adrenal failure in the post-burn period, and no "backswing" of hypoadrenalism during this time. On the contrary, the patients showed increased adrenal cortical activity lasting as long as the sixteenth to the seventeenth post-burn day. Following this period of increased activity, the blood and urinary corticoid levels returned to normal, but not subnormal, values. The patients with prolonged convalescence tended to show somewhat higher values again as complications developed in the late convalescent period.

It was possible for the adrenal to respond normally both to exogenously administered ACTH and to trauma in the post-burn period.

A period of diuresis on the first to the third post-burn day occurred in eight of the patients, and was probably related to a large intake of fluid immediately after the burn. It was of interest, however, that all of the patients showing this diuresis were receiving Cortisone and ACTH.

Two patients died while the study was under way. Both these patients had received cortisone and ACTH, and both had very high blood corticoid levels at the time of death. This was apparently due terminally to dehydration and diminished urinary output, and it may also have been due in part to impaired hepatic function leading to decreased conjugation of the blood corticoids, and therefore higher values of the free 17-hydroxycorticoids. All of the patients in the study had reversed A/G ratios for periods of time varying between ten and 50 days after the burn. Three of the most severely burned patients still showed reversal of the A/G ratio at the time of the last determination 50 days after the burn. This degree of hepatic damage could certainly in part account for the elevated levels of free blood corticoids. It would not, however, account for the increased urinary excretion of corticoids, because the corticoids are largely conjugated before they are excreted. Even the most severely burned and the sickest patients, including the two who died, had initially, marked elevation of the 24 hour urinary corticoid excretion. It is likely, therefore, that failure of the liver to conjugate blood corticoids, except perhaps in the very terminal stages, could not alone account for the high levels of free blood corticoids which were observed. Thus it would seem that there must actually have been increased production of 17-hydroxycorticoids by the adrenal.

The most interesting point for speculation concerns the difference noted in blood and urinary corticoid values between those severely burned patients who died, and those who survived (Table III). The patients in category 3 were severely burned, very sick patients. Two received cortisone and ACTH, two did not. All had elevated urinary corticoid excretion and high normal blood corticoid values. The two patients who died both received cortisone and ACTH, and both had much higher blood corticoid levels

and urinary corticoid excretion than the severely burned patients who survived. There is no definite experimental evidence to show that peripheral utilization of corticoids by injured tissues occurs. If this were the case one might postulate that a failure of utilization had occurred in the fatally burned patients, leading to very high accumulations of blood corticoids and excessive urinary excretion of these substances.

Another possible explanation is that the fatally injured patient who is in and out of shock may release some humoral substance that potentiates the effect of ACTH on the adrenal, leading to marked increases in steroid production above that normally seen in trauma alone. There is some experimental evidence to indicate that there may be a potentiation of adrenal response in oligemic shock, apparently on the basis of increased adrenal sensitivity to ACTH under these circumstances.^{4, 5} No final explanation for the observations made in these patients is yet available, however. One can at least feel confident that their demise was not a consequence of insufficient adrenal secretion.

Blood and urinary corticosteroid determinations were not begun until the fourth day after the burn. By this time corticosteroid levels in patients having major operative procedures have usually returned to normal. By contrast, patients having severe burns may continue to show elevated blood levels into the third week after the burn. Later in the convalescent period the patients with significant third degree burns, and other patients who develop complications, tend to have blood corticoid levels which are elevated above those seen in patients making good recoveries. The mean blood corticosteroid level for the fifth to twentieth post burn day in patients with over 45 per cent body surface burns who received no cortisone or ACTH was 26.1 micrograms per cent (range 18 to 35). The mean level for those patients with less than 45 per cent of the body surface burned was 18.7 micrograms per cent (range 8 to 34).

The mean level in the normal young male is 12 micrograms per cent.¹

The mean urinary corticosteroid excretion for the fourth to sixteenth day in patients with 45 per cent or more body surface burned who received no cortisone or ACTH was 15.5 mg./24 hours (range 13.6 to 18.8). The mean excretion in those patients with less than 45 per cent burns was 8.3 mg./24 hours (range 4.8 to 13.1). The mean excretion in the normal young male is 5.3 mg./24 hours.⁸ These figures suggest that a burn of 45 per cent of the body surface represents a very severe trauma, and that adrenal cortical secretion persists at high levels for quite a long time.

SUMMARY AND CONCLUSIONS

1. Plasma 17-hydroxycorticosteroids were measured in 26 severely burned patients from the fourth to the fiftieth post-burn day, and urinary 17-hydroxycorticosteroids from the fourth to the thirty-first day.

2. There was no evidence of adrenal failure in any patient during the period studied. No "backswing" of depressed adrenal function occurred.

3. These patients demonstrated increased adrenal activity lasting as long as 16 to 17 days after the burn. Following this, blood and urinary corticoid levels returned to the normal range, where they remained in patients with uncomplicated courses. In patients who developed complications in the convalescent period secondary activation of adrenal secretion was noted.

4. The adrenal was capable of responding to exogenous ACTH in the post-burn period.

5. The pituitary-adrenal mechanism was capable of responding with increased activity to operative trauma in the post-burn period in six of eight patients.

6. Two of the patients died during the study. Both of these patients had received cortisone and ACTH. One died on the ninth and one on the fifteenth post-burn day. Both had extremely high blood corticoid levels

persisting up to the time of death, and high levels of urinary corticoid excretion as well.

7. Fourteen of the 26 patients received cortisone therapy, in most instances from the first to the fifth post-burn day, and ACTH therapy, in most instances from the second to the sixth post-burn day. Twelve of the patients received no hormone therapy. In both of these groups of patients those who had greater than 45 per cent of the body surface burned tended to show higher blood levels of corticoids than those in whom less than 45 per cent of the body surface was burned. The patients with more than 45 per cent of the body surface burned, and who did not receive ACTH or cortisone, also tended to show a greater excretion of urinary corticosteroids than those with less extensive burns.

8. Both blood corticoid levels and 24 hour urinary corticoid excretion were elevated in the convalescent post-burn period. It would seem, therefore, that there had been an increased production of corticoids by the adrenal during this period, and that a burn represents a very prolonged stimulus to the hypothalamic-pituitary-adrenal cortical mechanism.

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