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AFSWP-443

1 January 1954

TITLE OF PROJECT

A STUDY OF THE EFFECTS OF TOTAL AND PARTIAL BODY RADIATION ON IRON METABOLISM AND HEMATOPOIESIS

PROGRESS REPORT

Contract Number DA - 49 - 007 MD - 428

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DTL 005, 762

Case #2

(1) Abstract.

Work has progressed since the last report along the lines previously indicated.

(a). Further demonstration of the physiological significance of the iron tracer studies in man, and the variations to be anticipated in disease states.

(b). Further demonstrations of the effect of total body radiation on the peripheral blood count and on the iron tracer studies, in man.

(c). Preparations are being made to include the effects of total body radiation on porphyrin metabolism in man.

Two manuscripts are enclosed for review and release prior to publication.

(2) Progress.

Probably the most valuable result of recent work under this contract, has been the development of a simplified method for performing the iron tracer studies. (See attached manuscript "The Use of Radioiron As a Tracer in the Clinical Study of Hemoglobin Production"). Until now, the technique for determining the plasma iron turnover rate and red cell incorporation was laborious and time consuming. Previous attempts to simplify this method, by making a stock solution of tagged iron binding globulin to avoid having to prepare the tracer individually for each test, have been sporadic and undependable both in this laboratory and in others (Abbott). The demonstration that iron citrate can be used as a tracer, opens the possibility of performing more tests of more dependable quality.

Several additional patients have received treatment with total body radiation in the 50 to 200r range. Case histories of the more recent patients are presented on the next two pages. (See also attached manuscript "Therapeutic Use of Total Body Radiation In Certain Malignant Conditions"). These case histories offer additional evidence for estimating the degree of hematopoietic depression to be expected from various exposure levels to total body radiation.

Iron tracer studies have also been performed on a number of patients with a variety of disease conditions, to obtain a better understanding of the significance of variations of these tracer studies in man.

(3) Future Studies.

The primary problem remains the study of patients being treated by total body radiation to determine quantitatively the relation between dose and effect in terms of symptomotology, hematopietic depression, changes in iron metabolism, and in other metabolic systems as indicated.

Single doses of 50 - 200r of total body radiation have been used routinely. Divided doses of total body radiation up to 400r total have been carefully studied and indicate that single doses may be increased to 250r for therapeutic effect without significant side effect. Further studies will explore the practicality of increasing the dose to this level.

The effect of total body radiation on porphyrin metabolism has been reported as showing a quantitative relation. This department is currently checking methods for the separation and quantitative determination of porphyrins, and it is proposed to add these studies to the investigation of all patients receiving total body radiation.

Although initially observations were carried out with 2 MV radiation, treatments have been carried out at 250 KV for the last 18 months. To date all radiation delivered has been of a maximum energy of 250 kilovolts. The financial and administrative difficulties of obtaining an x-ray generator of two million volt potential, have been essentially overcome, and it is expected that this x-ray generator will be ordered in the very near future.

Since the majority of the patients who have been treated with total body radiation, and who may be anticipated to be treated by this form of therapy in the future, are those with generalized neoplastic conditions, a better understanding of the status of the hematopoietic system in these patients is essential. The majority appear to have rapid turnover rates, with low plasma iron concentrations. In view of this initial abnormality, the interpretation of changes following total body radiation is not completely clear. The most active work of the radioiron group in this department is concerned with evaluating a variety of conditions which cause a rapid turnover rate with

a low plasma iron concentration. These studies, and the conclusions drawn, should be ready to be submitted at the time of the next progress report.

JOE CERDA CLINIC NO: AX-5284

A 35 year old Latin American male was well until three years ago. At that time he suffered a fracture of the cervical spine. He was told that he had a bone disease which involved most of the bones of the skeleton. The patient had a biopsy of the left iliac crest two years ago, and a pathologic diagnosis of multiple myeloma, or plasma cell myeloma was made. The patient did fairly well until four months ago; but since that time progressive weakness and severe back pain have been incapacitating. The patient has lost about 45 pounds since the onset of his illness, about 25 pounds occurring over the past year. X-rays have shown osteolytic lesions involving the vertebrae, ribs, and a large lesion in the left iliac crest. On physical examination, the patient appeared older than his 35 years. He was hunched, moved slowly and with a great deal of pain, and was quite pale. When transferred to the Jefferson Davis Hospital on July 14, 1953, he was transferred on a frame stretcher because of the fragility of his bones. On July 22, 1953 he received 200r total body radiation using 250 KVP with 1 mm Cu and 1mm Al filtration at a TSD of four meters. Following treatment there was no vomiting, only mild nausea, and anorexia for two days. He had prompt and significant pain relief; improved appetite after initial two to three days. On 8-12-53 another 200r total body radiation, with the same physical factors as previously, were given. Minimal systemic symptoms resulted (vomiting twice; anorexia, nausea as before). Within one week, the patient was up and about, completely free of back pain with an excellent appetite. He did begin to complain of pain in his feet and ankles, which may well have been related to his being up and about several hours per day, after five months in bed. Gradually his ankle pain cleared over the next six weeks as he continued to be up and about almost ad lib. He required five transfusions of 500 cc's each over the next six weeks, following which he was discharged to home without further need of narcotics or transfusions.

Joe Cerda — BLOOD STUDIES — HOSP NO: _____

CLINIC NO: _____

tment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
10 cc Fe 59 t.o.	7-15	3.4	8.8	33	1.0%	8,350	N-86, L-11, B-1, M-3	295,000	Absolute leukocyte values Gran 7,180, L-920
→ 200r Total body irradiation	7-22		8.5						
15 cc Fe59 t.o.	7-23	(*) 3.3	8.3	30	1.6%	6,000	N-87(2st-1juv), L-7 M-2, B-2, E-2		(*)(RBC's show a moderate anisocytosis & hypochromia)
	7-24-		7.8		0.9%	4,300	N-87(2st), L-9, M-4	255,000	Gran 5,460-L-420
	7-25	3.0	7.5		0.7%	4,300	N-91(1st), L-6, M-2, E-1	245,000	Gran 3,950-L-260
	7-27	3.2	8.2		0.7	3,850	N-85(2st), L-12, M-3	275,000	Gran 3,250-L-460
Fe t.o.	7-30	2.9	8.0	28	1.7%	4,000	N-78(1st), L-14, M-6, B-2	325,000	Gran 3,200-L-550
	8-4	2.4	7.4			8,050	N-74, L-23, M-1		
	8-5				.4%	4,850	N-75, L-25		
	8-6		7.2						
→ 200r	8-12	3.1	8.0			2,950	N-64, L-36		
Fe t.o.	8-13	2.38	7.1			2,050	N-72, L-27, E-1	52,360	
Fe t.o.	8-14	2.06	6.1		.1%	1,650	N-80, L-20	65,920	
	8-17	2.2	6.3		0	1,450	N-60, L-38, E-2	44,000	
	8-18	1.98	7		.6%	800	N-56, L-44	23,700	
	8-19	1.93	6.6			650	N-72, L-28		Only 50 WBC counted on Diff.

JOE CERDA — BLOOD STUDIES — HOSP NO: _____

CLINIC NO: _____

ment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
	8-20	2.03	6.2			650	N-26,L-72,E-2		50 WBC counted
	8-21	1.72	6.0			550	N-48,L-48,B-2		50 WBC counted
	8-22	1-96	6.8			600	N-45,L-54,B-1		
	8-24	1.98	6.4			1,850	N-70,L-30		50 WBC counted
	8-25-	2.32	7.2			1,350	N-62,L-36,B-2		
	8-26	2.07	7.0			950	N-72,L-28		
	8-27	2.39	7.2			1,050	N-77,L-23	23,900	
	8-28	1.87	7.2			1,650	N-84,L-16		
	8-29	1.91	7.6			1,000	N-65,L-32,M-1,B-2	13,370	
	8-31		6.7			1,100	N-73,L-26,M-1		
	9-1	2.53	7.0			1,250	N-76,L-22,M-2		
	9-2	2.65				1,200			
	9-3	1.83	6.1			1,550	N-58,L-32,M-10		
	9-4	1.59	7.7			1,700			
	9-5	2.50	6.2			1,350			
	9-8	1.99	6.1			1,600			
	9-9	1.66	6.4			1,500	N-68,L-31,M-1		
	9-10	1.93	6.6			1,200	N-91,L-5,M-4	Dismissed	9-10-53

NAME Joe Cerda IRON STUDIES HOSP NO:

DX CLINIC NO:

Treatment	Date	Turnover Half-Time	Plasma Volume	Plasma Iron Conc	Daily Iron Turnover	RBC Uptake %	Total RBC Iron	% Daily Replacement	Others
t.o.	7-15	0.5 hr.	2670	45					
	7-18					34%			
	7-20					68%			
200r total body radiation	7-22			31		83%			
t.o.	7-23	0.6 hr.	3000	39	XI	80%			
	7-25					110%			
	7-27					136%			
	7-30			26		166%			
t.o.	7-30	0.55 hr.	3080	22					
	8-1					208%			
	8-3					215%			
	8-6					223%			
	8-12					287%			
t.o.	8-13	1.0 hr.	2700	80					
	8-14					213%			
	8-17			95		297%			

NAME Jo[illegible] C[illegible]a

IRON STUDIES

HOSP NO:

DX

CLINIC NO:

Treatment	Date	Turnover Half-Time	Plasma Volume	Plasma Iron Conc	Daily Iron Turnover	RBC Uptake %	Total RBC Iron	% Daily Replacement	Others
	8-19					282%			
	8-21			46		280%			
	8-28			45					
	9-4					310%			
	9-10					263%			

BILLY JONES UNIT NO: AX-2809

A 27 year old white male with a ten year course of variable severity of back pain and stiffness of the back. He was diagnosed through a combination of clinical and laboratory tests and x-ray examinations as rheumatoid arthritis presumably of a Marie-Strumpell variety. He received a partial course of ATCH at the Veterans Hospital in Houston with no relief. On September 1, 1953 he received 200r skin dose total body radiation with 250 KVP irradiation filtered by 1 mm Cu and 1 mm Al at a TSD of 360 centimeters. This was an anterior port.

Patient had no subjective symptoms following this irradiation. By September 11 there was only minimal symptomatic relief of the back pain and the patient was started on localized therapy to the sacroiliac region. He received two treatments of 225r skin dose to a 10x15 field over the sacroiliacs, the first treatment on 9-11 and the second on 9-14. The plan was to continue the treatment at this rate for six weeks, but on 9-15 the patient was removed to the state penitentiary and lost to followup.

E Billy Jones

BLOOD STUDIES

HOSP NO:

CLINIC NO:

tment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
	8-25	5.0	12.3	40		13,200	N-63, L-30, E-4, M-3		
	8-27		12.4						
	8-29		12.7						
	9-1		12.1			12,800			
	9-2	4.1	12.2			7,200	N-83, L-16, M-1		
	9-3	4.7	13.0			7,000	N-84, L-11, M-5		
	9-4		12.7						
	9-5	4.4	10.9			6,700			
	9-8	3.9	11.3			7,200			
	9-9		12.0						
	9-10	4.1	9.3			6,400			
	9-11	4.8	12.5			6,900			
	9-12	5.1	12.9			9,000			
	9-14		12.1						

NAME Billy Jones IRON STUDIES HOSP NO:

DX CLINIC NO:

Treatment	Date	Turnover Half-Time	Plasma Volume	Plasma Iron Conc	Daily Iron Turnover	RBC Uptake %	Total RBC Iron	% Daily Replacement	Others
	8-25	0.6 hr.		100					
	9-2	1.2 hr.		K85					
	9-14			40					

Asta Hawkins Clinic No: AT-9654

This 60 year old white female came to the clinic complaining of generalized pain and limitation of motion of her joints. In particular, there was rather marked pain and tenderness in the right shoulder region.

After 50r total body irradiation (250 KVP, 15 MA, 1 mm Al, 1 mm Cu) as one treatment, there was aggravation of the right shoulder symptoms for two days; but, thereafter complete absence of pain and complete range of motion. This was followed in two weeks with local irradiation to the right shoulder region. Following the total body irradiation there was no nausea, vomiting, anorexia, malaise or lassitude.

Patient was referred to Orthopedic Clinic because of failure of local irradiation to control shoulder pain. A surgical procedure involving removal of the medial border of the scapula was recommended to the patient, but she refused this therapy. The patient was then lost to followup.

BLOOD STUDIES

Name Asta Hawkins Age_____ Hosp No:_____

Height_____ Weight_____ Clinic No: AT-9654

Treatment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
T.O.	7-9		10.8	41					
	7-11	4.7	11.2		0.2%	4,900	N-58, L-37, M-4		
	7-13	4.3	11.9		0.3%	5,400	N-59, L-34, E-4, M-3	115,000	
50r X-ray	7-15								
T.O.	7-16	4.3	11.2	39	0.8%	4,350	N-59, L-36, E-1, M-4	95,000	
	7-20		10.5		0.7%	3,650	N-59, L-31, E-2, M-7, B-1		
	7-28	4.0	11.0		1.0%	3,650	N-55, L-31, M-14	85,000	See note in blood data book in regard to monocytes.
	8-4		11.7						
	9-1	3.5	12.1			2,450	N-77, L-21, B-1, E-1		

Ike Gatlin Clinic No: AV-7730

This 74 year old retired colored farmer had been bothered with cramps in his legs for the past 30 years. About 30 years prior, he noted that his left leg was beginning to bow outward. He was treated sporadically over this 30 year period with pills from his local doctors. Two months prior to this admission, the cramps became more severe. On 5-21-53 patient was started on a course of x-ray therapy to the left knee receiving 100r skin dose to a 10x10 field over the left knee. He did not return for the remainder of his treatments until 9-23-53 when he was given another treatment of 100r skin dose followed on 9-25-53 by a third treatment of 100r skin dose. On 10-5-53, because of persistent pain in the right knee, right shoulder and generalized aches and pains, patient was given 100r skin dose total body radiation, factors of 250 KVP filtered with 1 mm of Cu and 1 mm of Al and a TSD of 60 centimeters to the anterior portion of the body. Within three days following this treatment, the patient was relieved of all discomfort except for minimal residual in the left knee. He experienced no nausea, vomiting, diarrhea or other unpleasant symptoms. Because of the persistent pain in the left knee, he was given 300r skin dose in three days from 10-20-53 to 10-22-53. Following the last treatment, he was given an appointment to return in two weeks. However, he has not returned for a followup.

BLOOD STUDIES

Name Ike Gatlin Age Hosp No:

Height Weight Clinic No: AV-7730

Treatment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
	~~9-4~~	~~4.4~~	9.9						
	~~9-8~~		13.4						
	~~9-22~~		11.8						
	9-30	4.0	9.9	35	0.6%	4,300	N-55, L-38, M-6, E-1	153,000	
Before TBR	10-5	4.2	9.7	42	0.4%	3,800	N-34, L-56, M-7, E-3	160,000 - Before Therapy 170,000 - One hour after Therapy 200,000 - Two hours after Therapy 210,000 - Three hours after Therapy	
	10-6	4.0	9.4	39	0.4%	2,950	N-30, L-66, M-3, E-1	200,000	
	10-8		9.5						
	10-13	3.9	11.2	36	0.3%	3,100	N-64, L-34, M-2	205,000	
	10-29		11.2						

Sam Ponder Clinic No: AG-9435

This patient, a 70 year old white male, has a history of multiple basal cell carcinomatous lesions on his face over the recent 20 years. He came in at this time primarily for treatment of a large left preauricular ulcerating squamous cell carcinoma. He was treated by a radium mould, delivering 7000r/7 days.

However, he complained of generalized arthritic symptoms. He was treated with 125r total body irradiation in a single treatment. (250 KVP, 15 MA, unfiltered).

Following the single total body treatment there was no anorexia, nausea, vomiting, malaise or lassitude. Also no further arthritic complaints were mentioned.

Patient has been doing well since treatment both to his left preauricular area as well as his total body radiation for arthritis. To this date he has had no further complaints with arthritis, and is undergoing plastic surgical care to the right portion of the face and to the left preauricular area which did not respond completely to radiotherapy.

BLOOD STUDIES

Name Sam Ponder Age____ Hosp No:____

Height____ Weight____ Clinic No: AG-9435

Treatment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
Fe-59 T.O.	7-24	4.6	12.3	43		7,300			# cells ct for retic
	7-27	4.5	12.7		0.9%	7,400	N-42, (1St.), L-51, M-7	100,000	1000
	7-28	11 AM			1.0%				1000
	7-28	11:30 AM			0.5%				3000 (0.5 (0.5 (0.5
X-ray									
	7-28	1 PM			0.8%				1000
	7-28	2:50 PM			0.7%				1000
	7-28	3 PM			0.3%				2000 (0.2 (0.4
	7-28	4 PM			0.6%				1000
	7-28	6:20 PM			0.5%				1000
Fe-59 T.O.	7-29		12.0	41	0.7%				1000
Fe-59 T.O.	7-30	4.8	12.0	42	0.8%	4,950	N-40, L-56, E-1, M-3	55,000	1000
	8-4		12.5						
	8-6		11.5						
	8-11	4.0	12.2			4,700	N-37, L-62, M-1	235,000	
	9-24	3.8	11.3						
	9-29	4.3	12.0						

NAME Sam Ponder IRON STUDIES HOSP NO:

DX CLINIC NO: AC-9435

Treatment	Date	Turnover Half-Time	Plasma Volume	Plasma Iron Conc	Daily Iron Turnover	RBC Uptake %	Total RBC Iron	% Daily Replacement	Others
Fe-59 T.O.	7-24	0.8 hr	2670	43	23.8 mg				
	7-27					48			
	7-28					72			
	7-29	2.0 hr	2700	144	32.3 mg				
	7-30	2.3 hr	2600						
	8-1					144	(In terms of 3 T.O.1s)		
	8-4			51		252	(In terms of 3 T.O1s)		
	8-6			64		279			
	8-11			28		297			
	9-22	1.3 hr		31					

William Dudley Clinic No: AJ-6024

The patient is a 72 year old white male who was admitted to the Surgery Service on 6-9-53 for elective repair of bilateral inguinal herniae. The admission blood count showed a WBC of 155,000, so the patient was transferred to the Medical Service. The patient has always considered himself in good health. There is no history of bruising, bleeding gums, fever or anorexia; however, he has lost 20 pounds during the past year. The patient has had hypertension for the past eight to ten years. He has had no exertional dyspnea, angina, peripheral edema or hemoptysis. He has had no cough or GI complaints.

Significant physical findings are a blood pressure of 200/88. There is a Grade II arteriosclerotic retinopathy. The left heart border is at the left anterior axillary line in the fifth interspace. The right heart border is substernal. There is a palpable thrill in the primary aortic area. There is a Grade IV aortic systolic murmur heard best in the primary aortic area. The liver is palpable four finger breadths below the right costal margin, and the spleen is palpable three finger breadths below the left costal margin. There are bilateral indirect inguinal hernia. The prostate shows a one plus benign prostatic hypertrophy. There is no lymphadenopathy.

IMPRESSION:
1. Myelogenous leukemia, chronic.
2. Arteriosclerotic heart disease and hypertensive cardiovascular disease with aortic stenosis. Functional Class II.
3. Inguinal herniae, indirect bilateral.
4. Emphysema, senile.
5. Cataract, right.

This patient was treated on 6-24 with 150r total body irradiation in a single treatment (250 KVP, 15 MA, 1 mm Al, 1 mm Cu). He experienced slight anorexia the following morning; however, by noon his appetite was back to normal. There was no nausea, vomiting, malaise or lassitude.

Patient seen on October 20 complaining of stabbing type of pain in right side of the vertebrae of T-12 radiating down across the abdomen to the symphysis pubis. This

had been present since July and was of mild nature. Examination at this time showed no palpable nodes or palpable spleen. The liver was down three finger breadths. X-rays were taken of the thoracic and lumbar spines, and showed generalized degenerative disc disease, with no other abnormality noted. Patient was given salicylates for treatment of his spinal condition.

E William Dudley

BLOOD STUDIES

HOSP NO: _____

CLINIC NO: AJ-6024

tment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
	6-10					165,000	P-32, Myelocytes-14, St-17, Myeloblast-14,		Main Lab
Fe-59 T.O.	6-12	4.24	10.8	38-V		138,500	Juv-12, Lymphs-7, E-4		
	6-12					182,000	P-29, Myelocytes-15, St-16, Myeloblasts-14,		Main Lab
	6-13				0.8%		Juv-10, Lymphs-8, E-8	Direct Count 180,000	
	6-15		9.6	V-38 (-WBC)					
	6-17		10.2	V-40 (-WBC)					
	6-19		10.2	V-40 (-WBC)					
	6-22		10.4						
Radiotherapy Sims RT	6-24	3.8	10.1	R-41		193,000	*Typical differential on attached sheet	265,000	
Fe-59 T.O.	6-25	4.0	10.0	W-59	1.2%	146,500		270,000	
	6-26	3.5	9.3		1.9%	101,500			
	6-27	3.5	10.3		1.8%	102,000		** 285,000	
	6-29	3.9	10.5		1.1%	83,000		200,000	
	6-30	3.7	9.7		0.8%	45,000		350,000	
	7-1	3.6	9.6		0.4%	30,250		225,000	

**Platelet count could very well be inaccurate due to fragments of degenerating cells being mistaken for platelets.

WILLIAM DUDLEY 6-13-53

DIFFERENTIAL

Myeloblasts	2
Promyclocytes	5
Myelocytes	
Neutrophilic	15
Basophilic	5
Eosinophilic	2
Metamyelocytes	10
Stabs	11
Polys	43
Eos	3
Bas	1
Lymph	1
Mono	1
Megaloblast	
	100

2 Normoblasts/100 WBC

BLOOD STUDIES

Name William Dudley Age____ Hosp No:____

Height____ Weight____ Clinic No: A.I-6024

Treatment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
T. O.	7-2	3.9	10.1	37	0.5%	25,000		225,000	
	7-4	3.3	8.2		0.6%	21,250			
	7-6	3.5	9.0		0.9%	16,000		265,000	
	7-7	3.0	8.7		0.8%	14,800		350,000	
	7-8	2.9			0.6%	15,600		285,000	
	7-9	3.3	8.0			15,400			
	7-10		7.5		0.8%	12,500			
	7-13	3.0	8.2		0.9%	15,500	L-4, E-3, B-19, M-1, N-72 (7 myelocytes, 1 Juv, 1 St)		*Many basophils are immature
	7-21	* 3.1	8.3			22,850	**B-19 N-69 (Ju-1, My-4), L-7, E-5		**RBC shows anisocytosis and poikilocytosis
	7-28	3.3	9.0			18,500	M-1, E-6, B-14, N-73 (1 St, 1 myelo), L-6		
	8-24		10.1						
	9-1		12.3			11,300	N-84, L-15, M-1		

NAME William Dudley

IRON STUDIES

HOSP NO: _____

DX _____

CLINIC NO: AJ-6024

Treatment	Date	Turnover Half-Time	Plasma Volume	Plasma Iron Conc	Daily Iron Turnover	RBC Uptake %	Total RBC Iron	% Daily Replacement	Others
T. O. IV 20 cc	6-12	0.6 hr	4760	38	49.5				
	6-15			38		95			
	6-17			99		129			
	6-19			111		118			
	6-22			62		104			
150r Total Body Radiation	6-24								
T. O.	6-25	2.0 hr	4400	111	40.5	100			
	6-27					144			
	6-29					2nd T.O. 152			
T. O.	7-2	1.3 hr	3750	67	32.0				
	7-9					2nd T. O. 205			

John Collier Clinic No: AX-7573

A 51 year old white male, was admitted on 9-10-53 with a biopsy diagnosis of multiple myeloma. He had been paraplegic, incontinent of urine and feces for three weeks; he had developed a large sacral decubitus ulcer; his general condition was poor and he complained of severe dorsal and lumbar back pain. He was placed on a Foster frame, and daily care given to the decubitus ulcer which did show slow improvement. The bladder catheter was maintained and he was continued on gantrisin, two grams per day. The patient required narcotics during his entire stay for the back pain, but following therapy only ten milligrams daily of pantopon was required for pain relief. On 9-15-53, he was given 200r total body radiation, using 250 KVP, filtered with 1 mm Al and 1 mm Cu, at a TSD of 360 centimeters. There was slight nausea of one day's duration, with no vomiting. There were no other subjective symptoms caused by the radiation. Because there was only partial loss of the tactile sensation accompanying the motor paralysis, the total body radiation was followed by local x-ray treatment to the entire vertebral column. He was given 675r in five treatments from 9-28 to 10-8 to the vertebral bodies from C-4 to S-1. There was no change detected in neurological findings; he did require considerably less narcotics for pain. The patient was returned to the Veterans Hospital on October 10 and was maintained on minimal narcotics until he expired on October 30.

E John Collier

BLOOD STUDIES

HOSP NO: _____

CLINIC NO: AX-7573

tment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
	9-11		9.9			8,550			
	9-15		11.0						
	9-21	1.8	8.3			9,150			
	9-22		7.6			8,000			
	9-23		11.2			7,000	N-83, L-10, M-7		
	9-24		11.0			8,200	N-77, L-19, M-4		
	9-25		10.1			6,600	N-76, L-20, M-4		
	9-26		7.0			6,800	N-75, L-20, M-5		
	9-28		8.0			6,900	N-71, L-26, M-3		
	10-5		6.5	21	.01%	5,800	N-85, L-11, M-4	220,000	
	10-6		6.8			4,800	N-86, L-13, B-1		
	10-7		5.7			4,050	N-83, L-16, M-1		
	10-8		6.4			4,500	N-82, L-16, M-2		
	10-9		6.3			4,600	N-83, L-13, M-2		

OLA BUCK HOSP NO: Y 13,361

A 58 year old white female admitted 11-2-53 with a complaint of backache radiating to the legs for six years. X-ray examination in April, 1948 showed the destruction of L-2. She received localized x-ray therapy with improvement of pain. In 1951 she had another course of therapy of this area, the third treatment in January, 1952. On February 23, 1952, she had a spinal fusion and a biopsy. The biopsy was inconclusive at that time. She did well at first following the operation, but subsequently developed a sinus tract at the site of fusion with infection. X-ray examination in May, 1953 showed an additional lesion in the skull, which was biopsied and found to be multiple myeloma. On 6-22-53 and again on 7-2-53 she received 950r skin dose over the lesion in the skull with no appreciable change in size. On 11-12-53 patient received 200r skin dose total body radiation to back with 250 KVP, filter of ½ mm Cu and 1 mm Al at a TSD of 365 centimeters. This was followed by minimal nausea, two episodes of vomiting without nausea, and moderate improvement of the pain with reduction of narcotic consumption to one-half of pretreatment levels. On 12-16-53 patient was given another 100r total body radiation without symptoms of nausea or vomiting, and further reduction in back and leg pain.

Ola Buce

BLOOD STUDIES

HOSP NO: I-13,361

CLINIC NO:

ment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
Fe T.O.	11-3	4.15	13.3	41%	.9%	6,050		146,000	
	11-6	3.98	12.8	40%					
	11-10	3.99	12.2	39%	1.2%	7,100	86-N, L-11, 3 unident. cells (13% Stabs)	148,000	
(Before R) Fe T.O.	11-12	4.0	12.6	41%	.9%	11,600	N-92, L-4, 4 unident. cells (19% Stabs)	148,000	
200r TBR (After R)	11-13 Fe T.O	3.49	11.1	34%	.9%	13,400	N-93, L-4, 3 unident. cells (17% Stabs)	150,000	
	11-14	3.62	11.5		.9%	11,650	N-95, L-3, 2 unident. cells (21% Stabs)	88,000	
	11-16	3.30	10.0	32%	1.1%	10,600	N-96, L-4 (7% Stabs)	104,000	
	11-17	3.53	11.0		1.5%	8,350	N-86, L-14 (2% Stabs)	100,000	
	11-18	3.0	9.8	31%	1.3%	5,200	N-87, L-13 (1% Stabs)	110,000	
	11-19	2.99	9.9		1.7%	5,000	N-80, L-20 (3% Stabs)	100,000	
	11-20	3.0	9.7	31%	2.1%	5,550	N-89, L-11 (4% Stabs)	102,000	
(Transfused)	11-30	2.71	8.7		1.5%	4,450	N-79, L-21	104,000	
	12-4	4.3	12.7		1.1%	3,200	N-78, L-21, E-1	118,000	
	12-7	3.35	10.9		.9%	2,650	N-79, L-21	124,000	
	12-9	3.46	10.6		.9%	2,600	N-63, L-35, E-1 1 unident.	98,000	

E Ola Luce

BLOOD STUDIES

HOSP NO: Y 13,361

CLINIC NO:

tment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
	12-11	3.41	10.[illegible]		.8[illegible]	2,200	N-73,L-26,E-1	52,000	
	12-14	3.2	10.7		.7[illegible]	4,150	N-70,L-26,(4 cells?)	92,000	
Fe t.o.	12-18	3.22	9.8	33.[illegible]	.7[illegible]	3,200	N-63,L-35(2 unident. cells)	66,000	
,	12-21	3.1[illegible]	9.2	32.[illegible]	.7[illegible]	4,150	N-84,L-16	68,000	
	12.-2[illegible]	2.9[illegible]	9.0		1.1[illegible]	4,150	N-77,L-23	54,000	
	12-28	2.8[illegible]	8.9		[illegible]	4,850	N-75,L-25	104,000	
	12.-30	2.80	8.9	29.[illegible]	1.9[illegible]	5,200	N-68,L-32	92,000	

This 18 year old white male had progressive, limitation of motion in back and hip. There was a gradual progressive course over an 18 months period, without significant period of remission. More recently there has been swelling and pain in the ankles, knees and feet. At no time has there been involvement of the upper extremities. X-ray examination of the joints indicated arthritis compatible with Marie Strumpell arthritis. Because of the generalized nature of the disease, on 8-13-53, 50r skin dose of total body radiation was delivered using 250 KVP filtered with one mm Cu and one mm of Al with a TSD of 360 centimeters. Following this therapy the patient experienced considerable symptomatic relief, he was noted to walk with more ease, walking almost upright in contrast to the previous markedly bent posture. There was no nausea or vomiting or other subjective symptomotology following the total radiation.

Since the only discomfort remaining after total body radiation was of the sacroiliac joints, on 9-28 the patient was started on localized treatment to a 10x15 cm. field over the sacroiliac joints. He received 600r tumor dose at D-5, this requiring 880 r skin dose in a 22 day period from 9-28-53 to 10-15-53, with further improvement in posture and symptomotology. On 10-22-53 patient was referred to the Texas Rehabilitation Center, and has been lost to followup since.

NAME Louis Frizell

IRON STUDIES

HOSP NO:

DX

CLINIC NO: AZ-997

Treatment	Date	Turnover Half-Time	Plasma Volume	Plasma Iron Conc	Daily Iron Turnover	RBC Uptake %	Total RBC Iron	% Daily Replacement	Others
Fe T.O.	8-6	0.7 hr	2780	61					
	8-10			70		78%			
	8-13					89%			
	8-14	0.8 hr		79 to 18					
	8-17			26		137%			
	8-21			53		175%			

E Louis Frisell

BLOOD STUDIES

HOSP NO:

CLINIC NO: AZ-997

tment	Date	RBC	Hgb	Hct	Retics	WBC	Differential	Platelets	Others
	8-6		12.3	41.5					
	8-10		12						
Before Therapy	8-13	4.4	11.9	39		7100	N-50, L-47, M-1, E-2	450,000	
Several hours after Therapy	8-13	4.6	12.1			8600	N-63, L-35, E-2	500,000	
	8-14	4.2	11.5	39	0.2%	6500	N-78, L-15, M-3, E-4	305,000	
	8-17	3.8	10.6		0.6%	6000	N-86, L-15, M-1, E-1	337,000	
	8-20	4.6	11.6			7600	N-60, L-39, B-1	225,000	
	9-28	3.6	7.9		0.2%	5000	N-64, L-28, M-4, B-2 E-2	140,000	