

77 ADDOCT  
NORTHWESTERN  
HOSPITAL  
a LifeSpan member

Nuclear Regulatory Commission  
Inspection Division  
Region III  
799 Roosevelt Road  
Glen Ellyn, Illinois 60137

1/14/93

Attn: Gary Shear

Dear Gary Shear,

As per our phone conversation this letter is a description and summary of the incomplete brachytherapy treatment on 1/6/93 using the Nucletron HDR unit. The HDR treatment was the last of four high dose rate boost treatments to a patient with esophageal cancer. The treatment required a single catheter placed down the patient's esophagus into the stomach. The middle 1/3 of the esophagus was then treated with the Iridium-192 HDR unit. The Written Directive called for an Active Length of 10cm with 21 Dwell(treatment) positions and a prescription dose of 500 cGy at 10mm(1cm) from the center of the catheter. Due to machine problems only 14 of the planned 21 positions were treated with two emergency interruptions. Thus, the most distal portion of the planned Active Length(last 3.5cm) was not treated and the actual treated length was the proximal 6.5cm of the planned Active Length. The two emergency interruptions required approximately 10 seconds of extra treatment time out of an actual delivered time of 176.4 seconds ( additional 5.6% ). Subsequent computer treatment plans show that the radiation dose at a distance of 10mm from the catheter for the treated 6.5cm length (including the extra 10 seconds of source "on" time at Dwell positions 20 and 8) is NOT different from that of the original plan at the same location ( plans enclosed ). Dr. Moryak then reviewed the total dose to the target area from all radiation treatments (5000 cGy from external linear accelerator beam irradiation, 1500 cGy from the three previous HDR boost treatments and this last incomplete treatment). From this analysis the radiation dose to the target volume was within 5-6% of the total planned dose of 7000 cGy and no further treatment was deemed necessary. A final updated Written Directive was completed documenting this unintended deviation due to equipment problems.

The response of the two physicist operators was appropriate. The Emergency Off procedure for the Nucletron worked correctly. For the area treated on this fourth HDR treatment, the patient did not receive a radiation dose different from the intended dose. The final target dose for all radiation treatments was within 5-6% of the intended dose. The NRC was contacted within 1 hour of the incident upon consultation with the Authorized User and Hospital Administration. The radiation safety officer for Nucletron was contacted at this time. Nucletron personnel(RSO and service engineer) were on site within 20 hours. The problem was duplicated and isolated to a CMOS oscillator on the U Comp board of the TCU. The problem was corrected by replacing the U Comp board on the TCU. The unit was thoroughly tested with no problems. This unintended equipment problem was appropriately addressed and in our opinion does not constitute a

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PDR ADDOCT 03000297  
C PDR

J. Thomas Payne  
J Thomas Payne PhD  
RSO

David Monyak MD  
Attending Physician

cc Tae Kim MD, Authorized User  
Don Brunn Administration  
Ken Priemesberger MD, Chm RSC

### High Dose Rate(FDR) Incident

Location: Abbott Northwestern Hospital  
NRC License: 22-04588-02

Authorized User: Tae Kim MD  
Designated user under direction of A.U.: David Monyak MD

HDR operators: Tony Murphy M.S.  
Tom Payne PhD, RSO

Date: Jan 6, 1993      Time: 10:15 AM  
Unit: Nucletron HDR    SN# 9282    Source Strength: 6.2 Curies on 1/6/93

Treatment site: Esophagus      Written Directive: Single catheter   Active Length 10cm  
500 cGy at 10mm from center catheter  
( 21 dwell positions from computer plan )

### Time Course of Events:

10:15 Computer treatment plan completed

10:23 Treatment console loaded with EPROM card, Checked and Verified, MD approved

10:25: Start treatment  
1st position treated, Unit locked-up, Emergency-off button pushed (approx. 5 sec)  
Prime Alert indicated Source was in safe position

Tom Payne, RSO went into room to inform patient and check unit

10:33 Reprogrammed remaining dwell positions, Checked and Verified, MD verified

10:34 Treatment Started

13 dwell positions treated and unit locked-up again, Emergency-off pushed (less 5 sec)

Situation reviewed with Physician. Physicists advised that unit was not reliable.  
Physician decided to stop treatment.

Physics Summary:

Total of 21 dwell positions planned. 14 dwell positions treated with two interruptions which added approximately 10 seconds to the treated time of 176.4 seconds. The total time was therefore 186.4 sec (  $186.4/176.4 = 1.056$  or 5.6% greater ).

Effect on Patient:

No acute effect. No chronic effects anticipated. The treatment was the last of four high dose rate boosts to the esophageal tumor area. The area undertreated was mostly distal to the gross tumor. Do not feel any predictable change in tumor control will result.

10:45 Treatment Unit Secured and taken out of use.

11:45 NRC notified after consultation with Administration and Authorized User.  
Nucletron notified.

NEXT DAY 1/7/93

8:30 AM Nucletron "on site".  
Interviewed hospital personnel involved.

Later in day isolated problem to CMOS oscillator on U Comp board of TCU.  
Replaced U Comp board.  
Tested unit; no problems.

# HDR Written Directive for Temporary Implant

Date: 1-6-93

Verified

Patient: [REDACTED] ☒Hosp. ID: [REDACTED] ☒

D.O.B.: \_\_\_\_\_

Treatment Site: EsophagusFinal Updated DirectiveSource type: Ir-192Activity on date of treatment: 6.20 Ci# of Catheters to be treated: 1Initial PrescriptionEstimated Active Length: 10 cmDose: 500 cGy at 10 mm

Delivery \*

Final PrescriptionActual Active Length: 6.5 cmDose: 500 cGy at 10 mmTotal treatment time: 176.4 seconds

HDR index value: \_\_\_\_\_ (for single catheter only)

HDR index value =  $\frac{\text{Activity} \times \text{time}}{\text{Active length}}$ 

\* Due to equipment problems  
last 3.5 cm of active length  
not treated. Area undertreated  
is mostly distal to gross  
tumor. Do not anticipate any  
predictable change in tumor control.

Authorized User [Signature]Physicist [Signature]

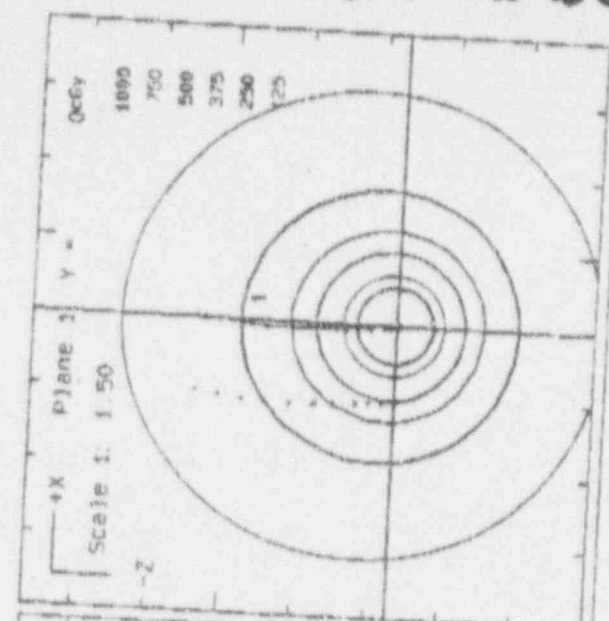
Patient verified by two methods

Treatment in accordance with written directive

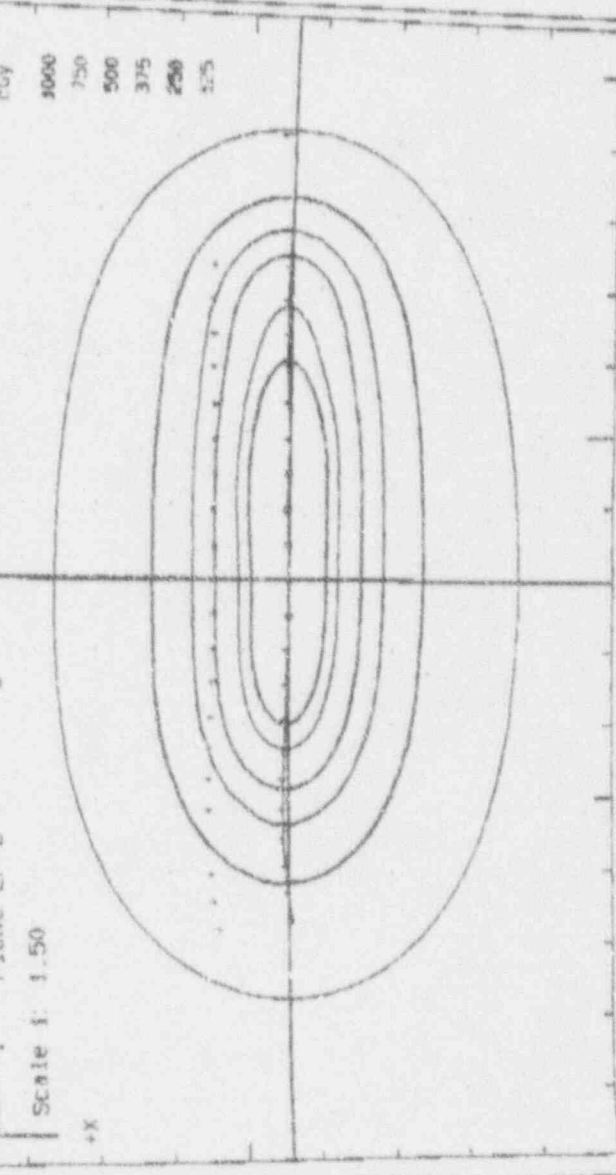
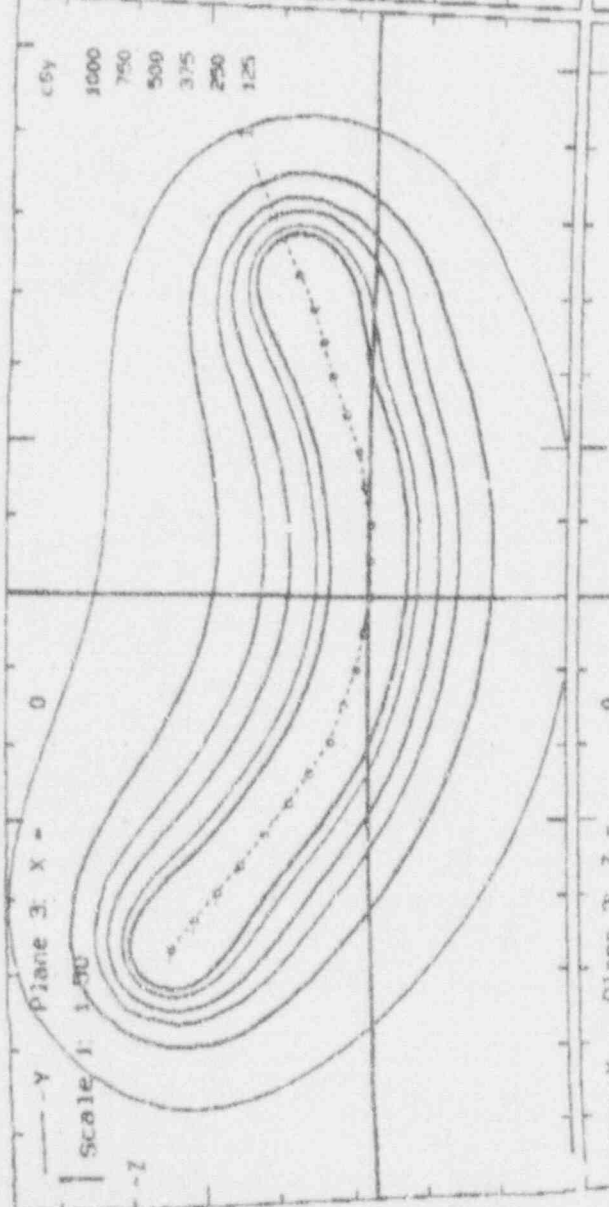
Yes	No	Initials
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<input checked="" type="checkbox"/>	<input type="checkbox"/>	<u>_____</u>

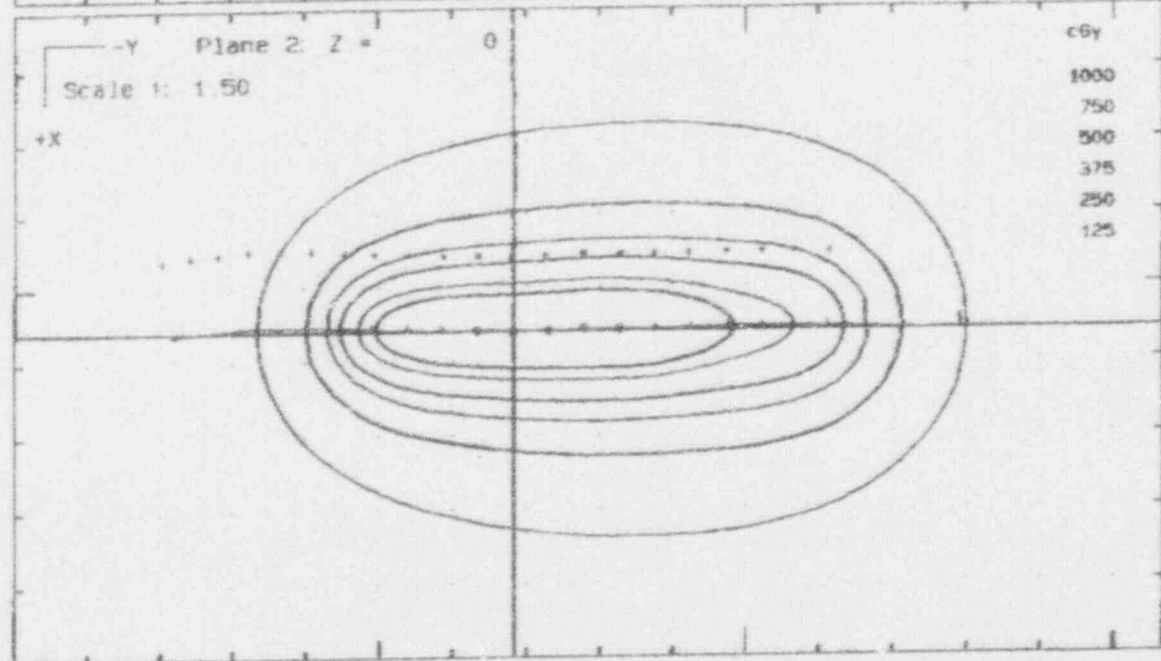
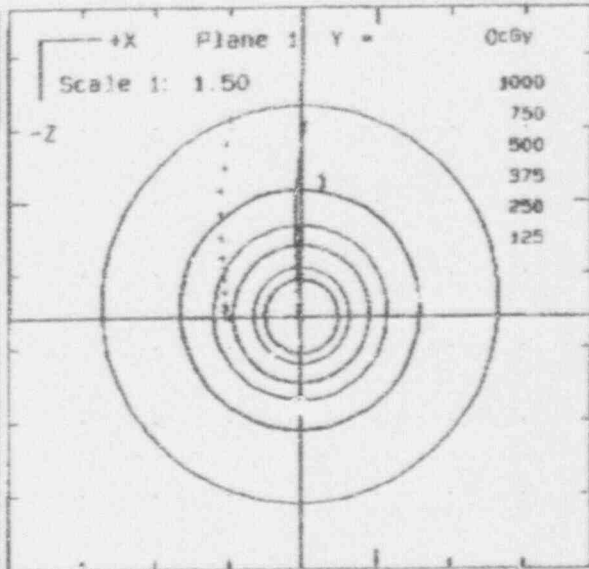
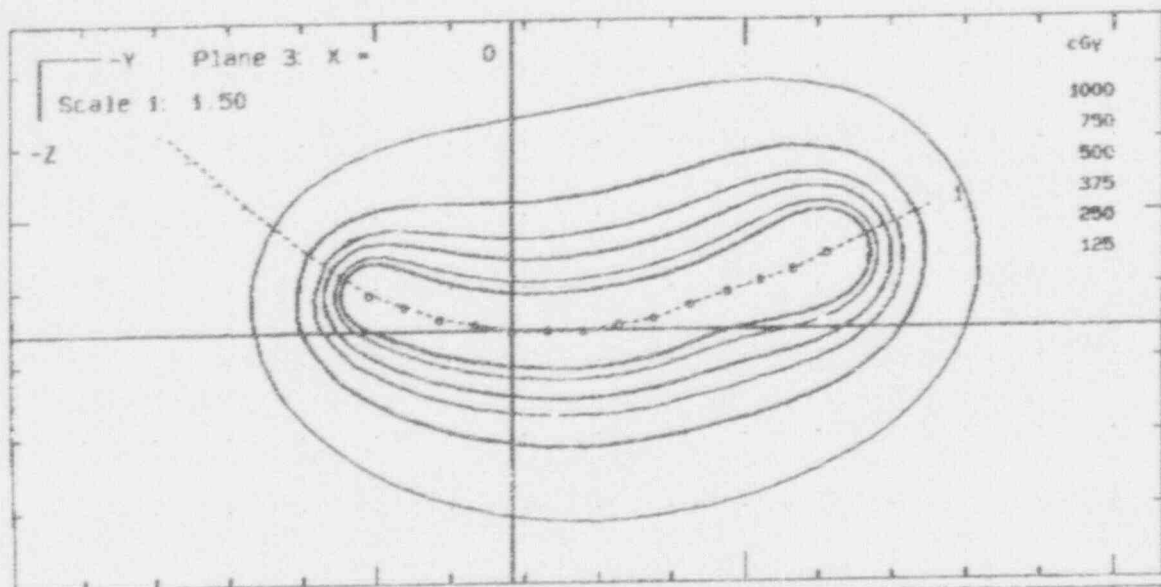


... .. treatment  
for 1/6/93  
21 Dwell positions  
500 cGy @  
Ten



Pat. ID:   
Date: 6 Jan 1993  
Institute: A.N.W. Hospital  
Set-up ID: 1993-01-06/10:19.3  
Cust. ID: 1992-11-23/15:38.5  
Coord. system: Interactive axes  
Ir-192 Act. 6.200 Ci  
Dose calc: Isotropic  
Dpt. on dose pts / distance  
UP'S version: 10.22





Pat.: XXXXXXXXXX

Date: 6-Jan-1993

Institute: A.N.W. Hospital

Set-up ID: 1993-01-06/10: 19: 3

Cust. ID: 1992-11-23/15: 38: 5

Coord.system: Interactive axes

In-192: Act.= 6.209 Ci

Dose calc: Isotropic

Not optimized

UPS version: 10.22

*[Handwritten signature]*

*14 dwell positions  
recovered  
Treatment on 1/6/93*

*500 cGy  
1 cm*