



Clinical benefits of IMRT

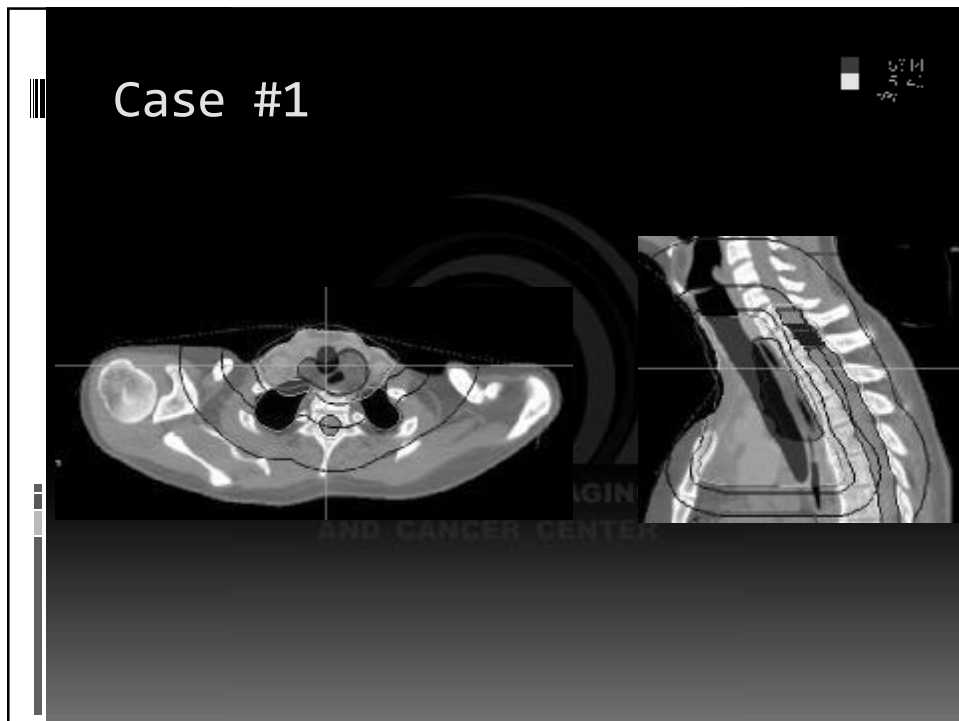
Evidence behind use of intensity-modulated radiotherapy: a systematic review of comparative clinical studies

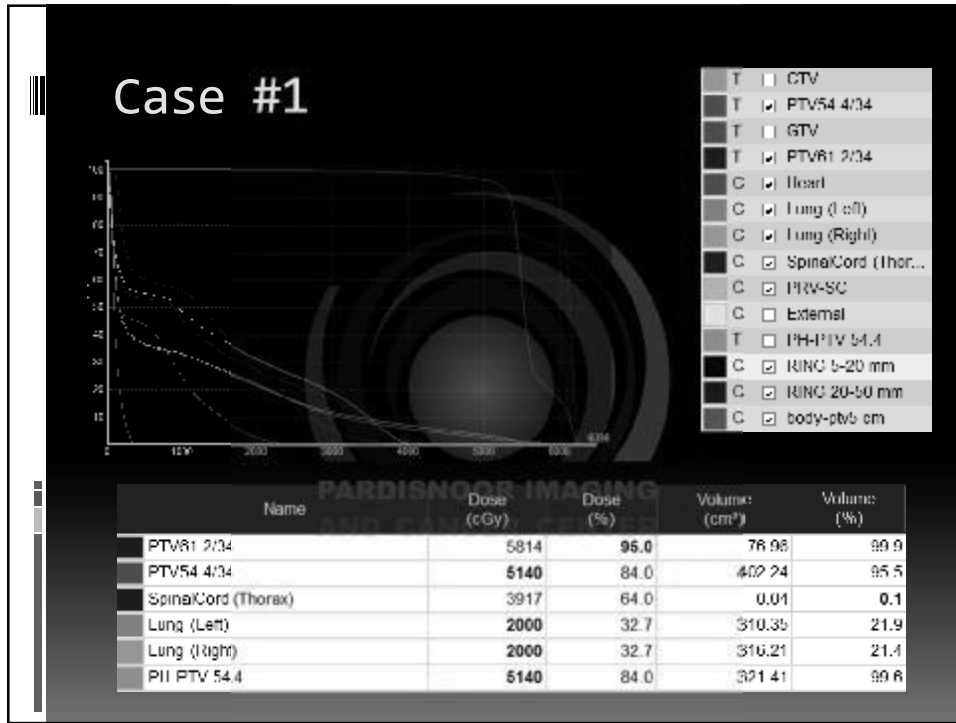
Clinical Oncology, 20(2019) 462-477
 Evidence base number 43 (Evidence-based)
 Clinical Oncology
 doi:10.1016/j.clinonc.2019.04.001

Overview
 A Review of the Clinical Evidence for Intensity-Modulated Radiotherapy (IMRT) on Behalf of the Radiotherapy Development Board
 Health Services Research Hub
 2019 (London, United Kingdom: 4th March, 2019)

Clinical benefits and expanding indications

	Decrease TOXICITY	Improve LOCAL CONTROL	Improve SURVIVAL
Head and neck	✓	✓	✓
Prostate	✓	✓	✓
Lung	✓	✓	✓
Sarcomas	✓	✓	✓
Brain tumors	✓	✓	✓
Oligometastases	✓	✓	✓
Gynecological	✓	✓	-
Gastro-intestinal	✓	✓	-
Breast	✓	-	-
Lymphomas	✓	-	-
Pediatric	✓	-	-





Case #1

Target Objectives:

Name	Overlap Priority	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	Min Dose (cGy)	Min Dose Penalty
TVS 43	1	<input checked="" type="checkbox"/>	200	4900	3000	50.00	49.00	49.00	3000
TV PTV50	2	<input checked="" type="checkbox"/>	150	4500	1500	50.00	45.00	45.00	1500

Critical Constraints:

Name	Overlap Priority	Beam Intersection	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	DVH Penalty
SB	1	Allowed	<input checked="" type="checkbox"/>	100	4700	10000	100.00	2500	1000
RK	2	Allowed	<input checked="" type="checkbox"/>	30	4275	500	20.00	1500	5000
LK	3	Allowed	<input checked="" type="checkbox"/>	50	800	1000	20.00	500	1000
Liver	4	Allowed	<input checked="" type="checkbox"/>	30	5000	50	60.00	1000	1000
PRV (CR)	5	Allowed	<input checked="" type="checkbox"/>	50	3500	100	5.00	2500	1000

Case #2

Target Objectives:

Name	Overlap Priority	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	Min Dose (cGy)	Min Dose Penalty
PTV	1	<input checked="" type="checkbox"/>	200	4900	3000	50.00	49.00	49.00	3000
PTV50	2	<input checked="" type="checkbox"/>	150	4500	1500	50.00	45.00	45.00	1500

Critical Constraints:

Name	Overlap Priority	Beam Intersection	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	DVH Penalty
SB	1	Allowed	<input checked="" type="checkbox"/>	100	4700	10000	100.00	2500	1000
RK	2	Allowed	<input checked="" type="checkbox"/>	30	4275	500	20.00	1500	5000
LK	3	Allowed	<input checked="" type="checkbox"/>	50	800	1000	20.00	500	1000
Liver	4	Allowed	<input checked="" type="checkbox"/>	30	5000	50	60.00	1000	1000
PRV (CR)	5	Allowed	<input checked="" type="checkbox"/>	50	3500	100	5.00	2500	1000

DVH Curves:



Case #3

Beam Objects

Beam	Beam No.	Imp	Max Dose (cGy)	Max Dose Penalty	DWH Vol (%)	DWH Dose (cGy)	Min Dose (cGy)	Min Dose Penalty
1-3	108	3800	1	58.08	2500	2500	10	
1-3	109	3800	10	58.08	3800	3800	100	

Critical Constraints

Name	Overlap Priority	Beam Intersection	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DWH Vol (%)	UVL Dose (cGy)	DWH Toxicity
RIN 550	1	Allowed	<input checked="" type="checkbox"/>	10	2900	5	80.00	1000	30
Jej 430cc 24Gy.ma...	2	Allowed	<input checked="" type="checkbox"/>	35	2700	50	1.00	1	1
Stomach 43cc 27Gy...	3	Allowed	<input checked="" type="checkbox"/>	10	2700	100	10.00	1000	1
Duodenum 45cc 25G...	4	Allowed	<input checked="" type="checkbox"/>	10	2500	10	1.00	1	1
Liver 700ml 21Gy	5	Allowed	<input checked="" type="checkbox"/>	10	1500	10	1.00	1	1
Kidney (left)	6	Allowed	<input checked="" type="checkbox"/>	5	300	1	10.00	200	1
Kidney (right)	7	Allowed	<input checked="" type="checkbox"/>	5	200	1	5.00	100	1

Beam On Time (sec): 266.9 Actual Modulation Factor: 1.5
 Estimated Gantry Period (sec): 37.5 Active Robotic: 7.0

Dose Statistics Table

Name	Dose (cGy)	Dose (%)	Volume (cm ³)	Volume (%)
PTV30	2850	95.0	13.09	98.0
Jej 430cc 24Gy.ma...	2400	80.0	0.32	0.4
Duodenum 45cc 25Gy...	2500	83.3	0.19	1.2
Stomach 43cc 27Gy...	2500	83.3	2.82	2.0
Liver 700ml 21Gy	2100	70.0	7.25	0.5
Jej 430cc 24Gy.ma...	2019	87.3	0.10	0.1
Stomach 43cc 27Gy...	2085	98.2	0.10	0.1
Duodenum 45cc 25Gy...	2031	87.7	0.10	0.6



Case #1

Plan Setup
 Jaw Mode:
 Dynamic
 Field Width:
 5.0 cm - Jaws(2.10, -2.10)
 Pitch:
 0.418
 Modulation Factor:
 2.300

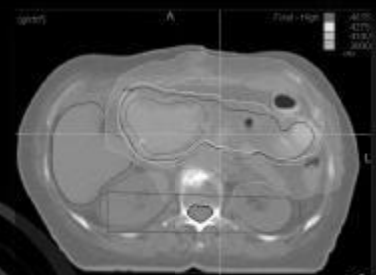
Rcwrt On Time (sec): 100.3 Actual Modulation Factor: 1.6
 Estimated Gantry Period (sec): 15.6 Active Rotations: 6.3

Prescription: Median For: PTV 45/25 50.00 % will receive 4500 cGy in 25 Fractions

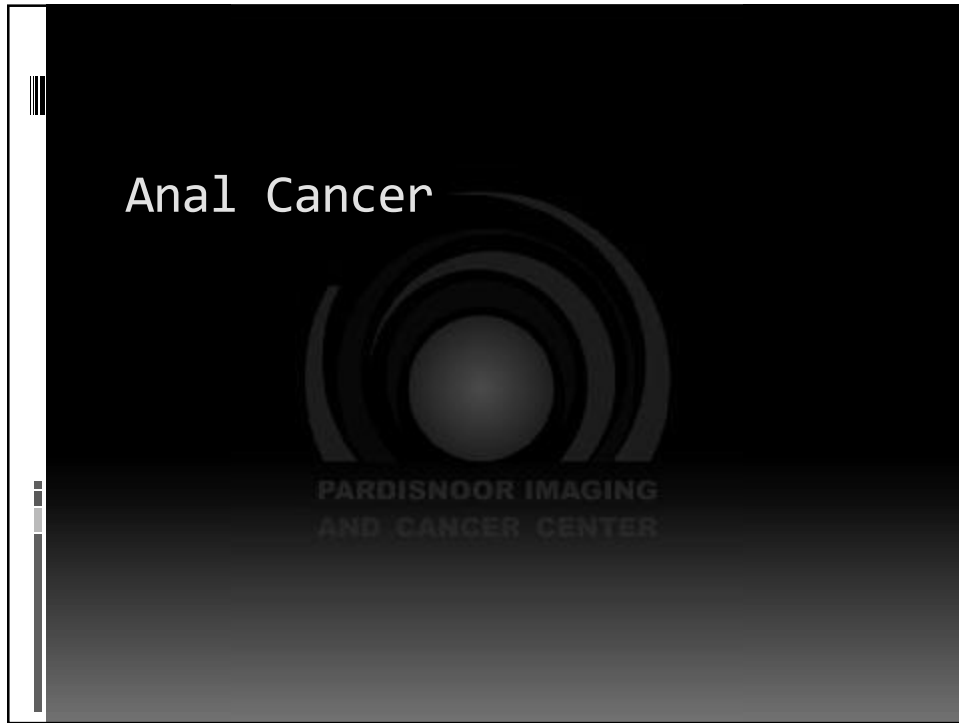
Name	Overlap Priority	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	Min Dose (cGy)	Max Dose Penalty
PTV 45/25	1	Allowed	100	4500	75	50.00	4500	4000	120

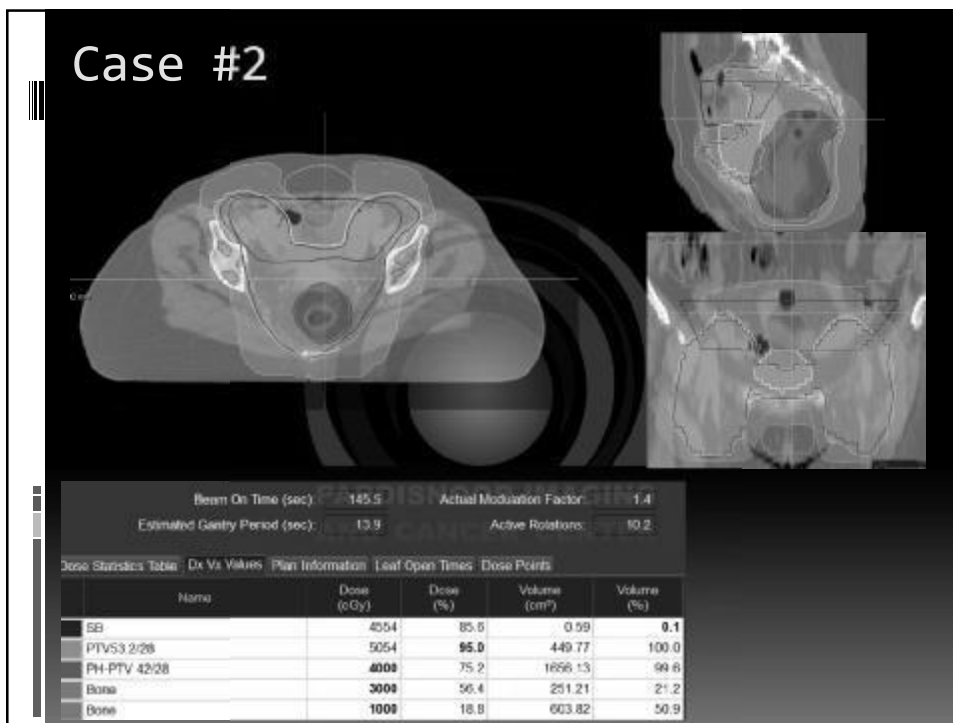
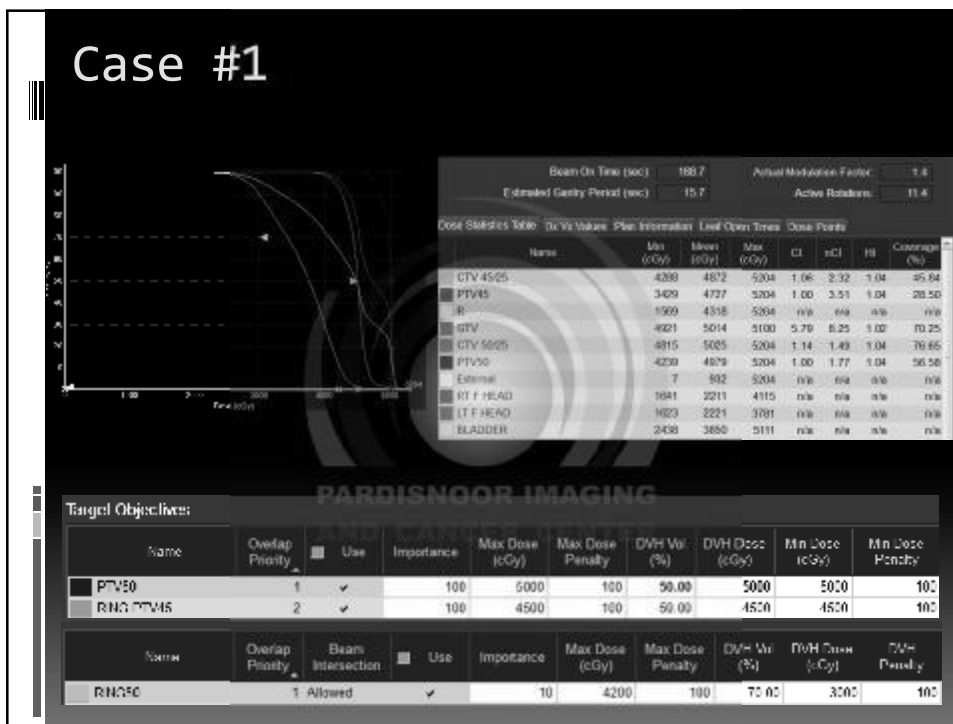
Name	Overlap Priority	Beam Intersection	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	DVH Penalty
Heart Opt 2mm	1	Allowed	Allowed	3	4250	5	50.00	500	20
L Kidney Opt 2mm	2	Allowed	Allowed	5	4150	5	50.00	1000	20
RT KIDNY	3	Allowed	Allowed	5	3750	5	50.00	350	20

Case #1



Name	Min (cGy)	Mean (cGy)	Max (cGy)	CI	σCI	HI	Coverage (%)
PTV 45/25	3666	4490	4688	1.01	2.08	1.04	48.39
Esoma	8	596	4688	n/a	n/a	n/a	n/a
LIVER	96	1764	4561	n/a	n/a	n/a	n/a
RT KIDNY	91	909	4237	n/a	n/a	n/a	n/a
LT KIDNY	150	1356	4317	n/a	n/a	n/a	n/a
CTV	4294	4516	4685	n/a	n/a	n/a	n/a
SPLEEN	1606	3280	4678	n/a	n/a	n/a	n/a
HEART	55	405	4451	n/a	n/a	n/a	n/a
AORT	67	1811	4601	n/a	n/a	n/a	n/a
Lung (Left)	13	420	4592	n/a	n/a	n/a	n/a
Lung (Right)	13	115	2175	n/a	n/a	n/a	n/a
SpinalCord (Thorax)	11	613	2498	n/a	n/a	n/a	n/a
Liver Opt 3mm	96	1675	4272	n/a	n/a	n/a	n/a





Case #2

Prescription Median For PTV53.2/28 50.00 % will receive 5320 cGy in 28 Fractions

Target Objectives

Name	Overlap Priority	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	Min Dose (cGy)	Min Dose Penalty
PTV53.2/28	1	<input checked="" type="checkbox"/>	120	5320	100	50.00	5320	5320	100
PH-PTV 42/28	2	<input checked="" type="checkbox"/>	150	4750	100	50.00	4200	4200	100

Critical Constraints

Name	Overlap Priority	Beam Interaction	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	DVH Penalty
SP-OUT	1	Allowed	<input checked="" type="checkbox"/>	4	4000	25	90.00	2500	10
BLADDER OUT	2	Allowed	<input checked="" type="checkbox"/>	3	4000	25	75.00	2500	10
SB in PTV	3	Allowed	<input checked="" type="checkbox"/>	2	4000	15	50.00	4000	10
BLADDER mid 42 Gy	4	Allowed	<input checked="" type="checkbox"/>	1	4050	10	50.00	3900	10
ovoid	5	Allowed	<input checked="" type="checkbox"/>	5	2200	10	70.00	1500	10
R Femur	6	Allowed	<input checked="" type="checkbox"/>	3	3500	10	90.00	1000	10
L Femur	7	Allowed	<input checked="" type="checkbox"/>	3	3500	10	90.00	1000	10
Bladder in PTV 53.2	8	Allowed	<input checked="" type="checkbox"/>	1	5100	10	50.00	5050	10
RNG 5.2.5	9	Allowed	<input checked="" type="checkbox"/>	5	3750	10	70.00	2300	10
							90.00	900	10
							50.00	2700	10
RNG 2.5.5	10	Allowed	<input checked="" type="checkbox"/>	5	2900	10	50.00	1900	10
							30.00	1900	10
							80.00	1000	20

Rectal Cancer



PARDISNOOR IMAGING
AND CANCER CENTER



Case #1

Prescription: Median For: PTV50.4:28 50.00 % will receive 5040 cGy in 28 Fractions

Name	Overlap Priority	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	Min Dose (cGy)	Min Dose Penalty
PTV50.4:28	1	<input checked="" type="checkbox"/>	100	5040	50	50.00	5040	5040	50
PRV.4E.PRV	2	<input checked="" type="checkbox"/>	100	4500	50	50.00	4500	4500	50

Name	Overlap Priority	Beam Intersection	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	DVH Penalty
SMALL INTLS R	1	Allowed	<input checked="" type="checkbox"/>	10	4200	10	62.00	2000	10
RNGC0	2	Allowed	<input checked="" type="checkbox"/>	10	4200	30	52.00	3000	10
R ADOP1.PRV	3	Allowed	<input checked="" type="checkbox"/>	10	2800	10	92.00	1000	1



Case #2

Target Objectives

Name	Overlap Priority	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	Min Dose (cGy)	Min Dose Penalty
PTV	1	<input checked="" type="checkbox"/>	100	5000	5000	50.00	5000	5000	10000
PTV IN 45	2	<input checked="" type="checkbox"/>	200	4500	5000	50.00	4500	4500	10000

Critical Constraints

Name	Overlap Priority	Beam Interaction	Use	Importance	Max Dose (cGy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (cGy)	DVH Penalty
SMALL INTESTIN	1	Allowed	<input checked="" type="checkbox"/>	30	4275	1000	35.00	3000	1000
AVOID	2	Allowed	<input checked="" type="checkbox"/>	60	2500	100	22.00	1500	100
BLAD	3	Allowed	<input checked="" type="checkbox"/>	50	4275	1000	10.00	1000	1000
RECTUM	4	Allowed	<input checked="" type="checkbox"/>	10	5000	10	5.00	1000	10
RECTUM-30025	5	Allowed	<input checked="" type="checkbox"/>	10	4000	10	5.00	3000	10
LITL/NOAL/HEAD	6	Allowed	<input checked="" type="checkbox"/>	10	3000	10	10.00	2000	10
LITL/NOAL/HEAD	7	Allowed	<input checked="" type="checkbox"/>	10	3000	10	10.00	2000	10

Case #3

Critical Constraints

Name	Overlap Priority	Beam Intersection	Use	Importance	Max Dose (Gy)	Max Dose Penalty	DVH Vol (%)	DVH Dose (Gy)	DVH Priority
PTV 45 Rng 10-4	1	Allowed	✓	5	4300	20	50.00	2700	10
Bladder OAR	2	Allowed	✓	5	4200	20	90.00	1200	70
Rectum P 10-20mm	3	Allowed	✓	5	4600	20	60.00	2000	40
Small Intestine	4	Allowed	✓	4	3600	20	60.00	1100	70
							90.00	1000	80
							30.00	1000	80
Small Intestine	5	Allowed	✓	1	1	1	1.00	1	1
PTV	6	Allowed	✓	2	3000	30	1.00	1	1
PTV 45 Rng 7-20mm	7	Allowed	✓	1	1	1	1.00	1	1
Rectum	8	Allowed	✓	2	3000	30	1.00	1	1

مجموعه کتابهای پزشکی ایرانیکا
 ■ عبدالله شیدر، استاد دانشگاه و مؤلف کتابهای پزشکی بر
 ۱۲ سالگی از دنیا رفت.
 ■ او نگرانی پزشکی داشت (بسته تحصیلی پزشکی که در سال ۱۳۵۸ از
 دانشگاه بهین شهر لندن با موفقیت گذراند) در سال ۱۳۵۸ (۱۳۵۸) بود.
 عضو هیات علمی دانشگاه پزشکی، دانشکده علم و صنعت ایران
 و پزشک شاد.

See translation

صورت زبانه می آید به کار
 حرفی از معنی اگر داری پیدا
 مولانا

END

PARDISNOOR IMAGING AND CANCER CENTER

A. Ghanbarzadeh