

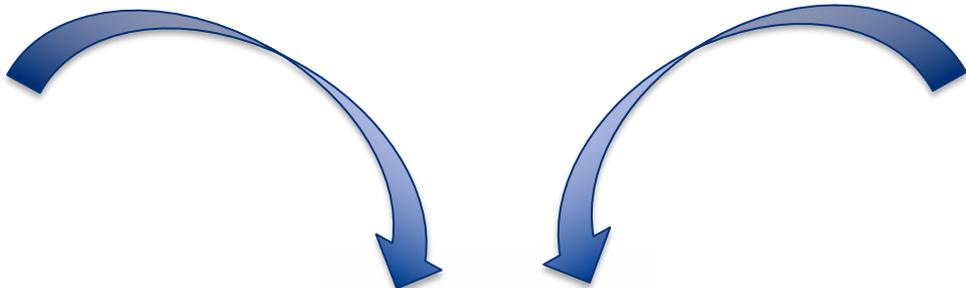
Webinar of the Federal
Commission on Radiation
Protection (KSR) 2021
Radiation Protection in Medicine

Radioprotection in
clinical practice :
small efforts and
huge effects !

C. Chevallier



CHUV



DACS

- constructor point of view
- Practical use :
 - CT
 - Fluoroscopy
 - Miscellaneous (OR)

DoseWatch™

*DoseWatch is a comprehensive integrated solution that enables **radiation dose** and **contrast parameters** management, optimization and standardization. It is a web-based dose management solution that captures, tracks, and reports radiation and contrast dose directly **from the medical device** or **PACS**.*

*It is a multi-modality and **vendor agnostic solution** that can support optimizing dose levels by helping to detect possible causes of excess radiation. Thanks to its analytical functions and visualization abilities the system helps to get more transparency and dose awareness. Thus focused images can be produced in diagnostic exams with lower exposure.*

Contrast only with 4th generation injectors

Unable to differentiate datas from pacs

Some constructors more «GE friendly» than others...

Practical use

Problems

Protocols / interventions
names

Manual entries

NRDs to use

Time allowed (prevision vs
reality)

Solutions

Standardization

Forbidden

The closest... or home
made

10% vs half/full time job !

CT

Structured analysis

Built protocols

NRDs used and «well»
defined

Dose «known»

Justification

Optimisation

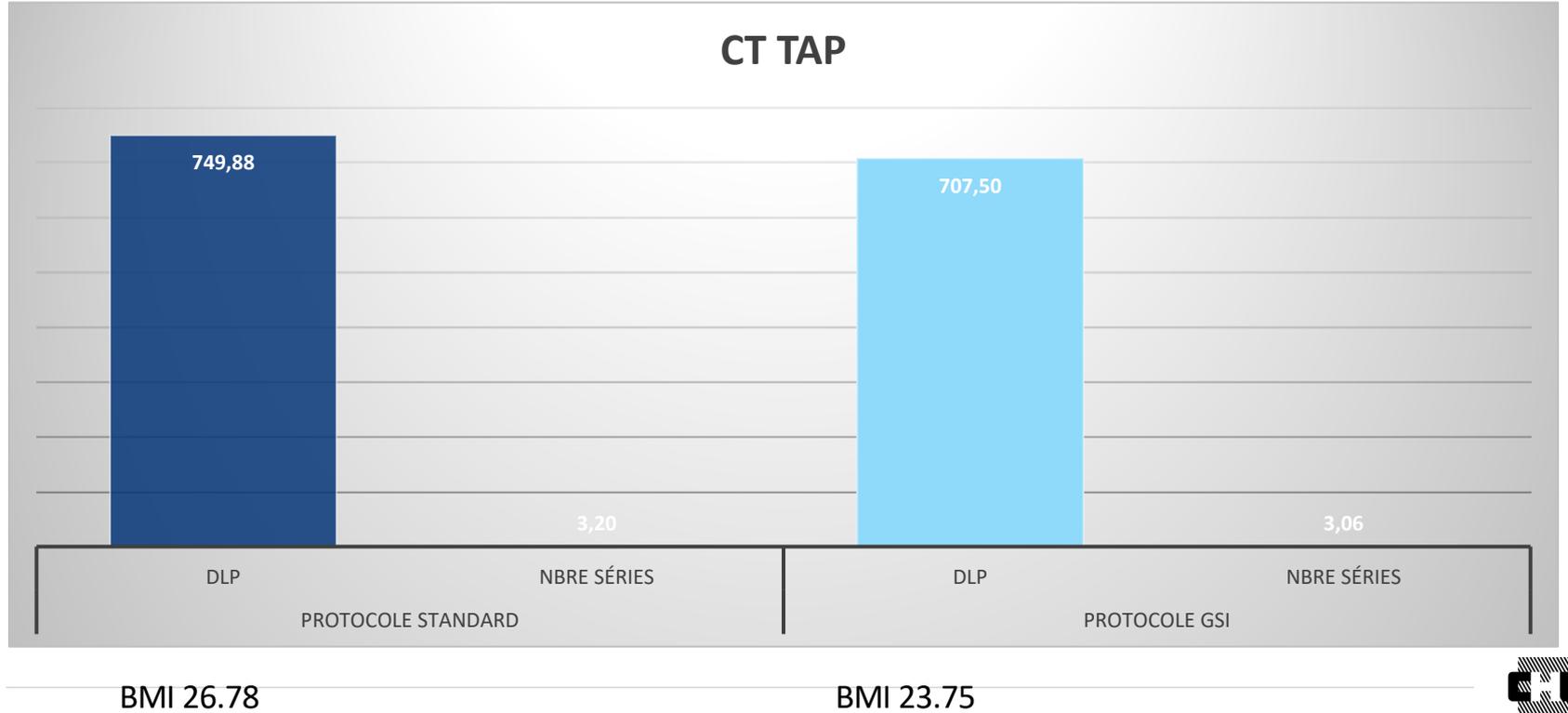
Limitation

CT

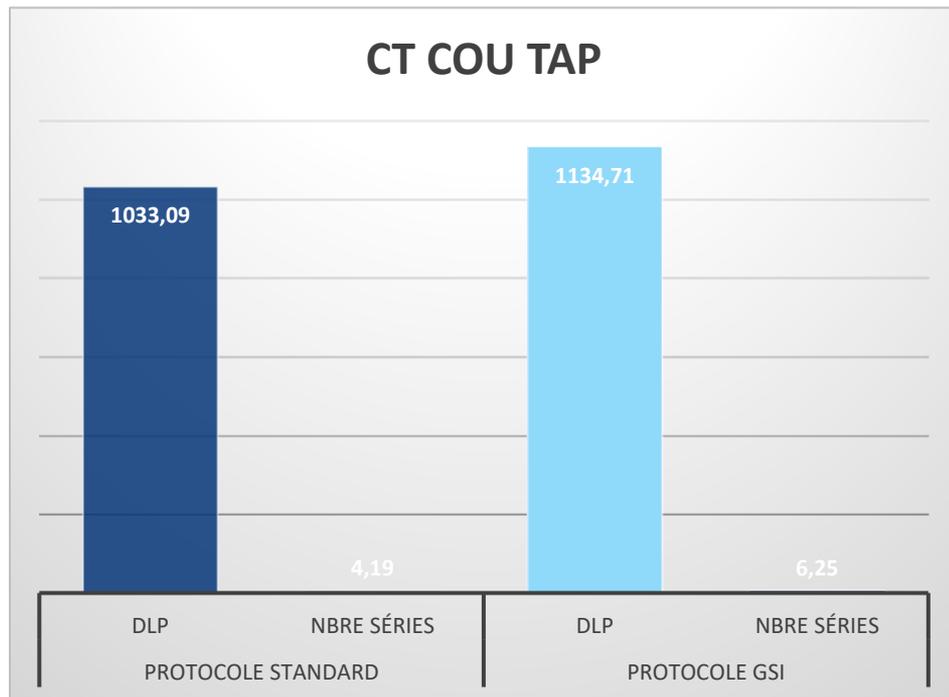
Comparison of practice,
protocols

Used to change or
validate changes in
practice/protocols

CT TAP



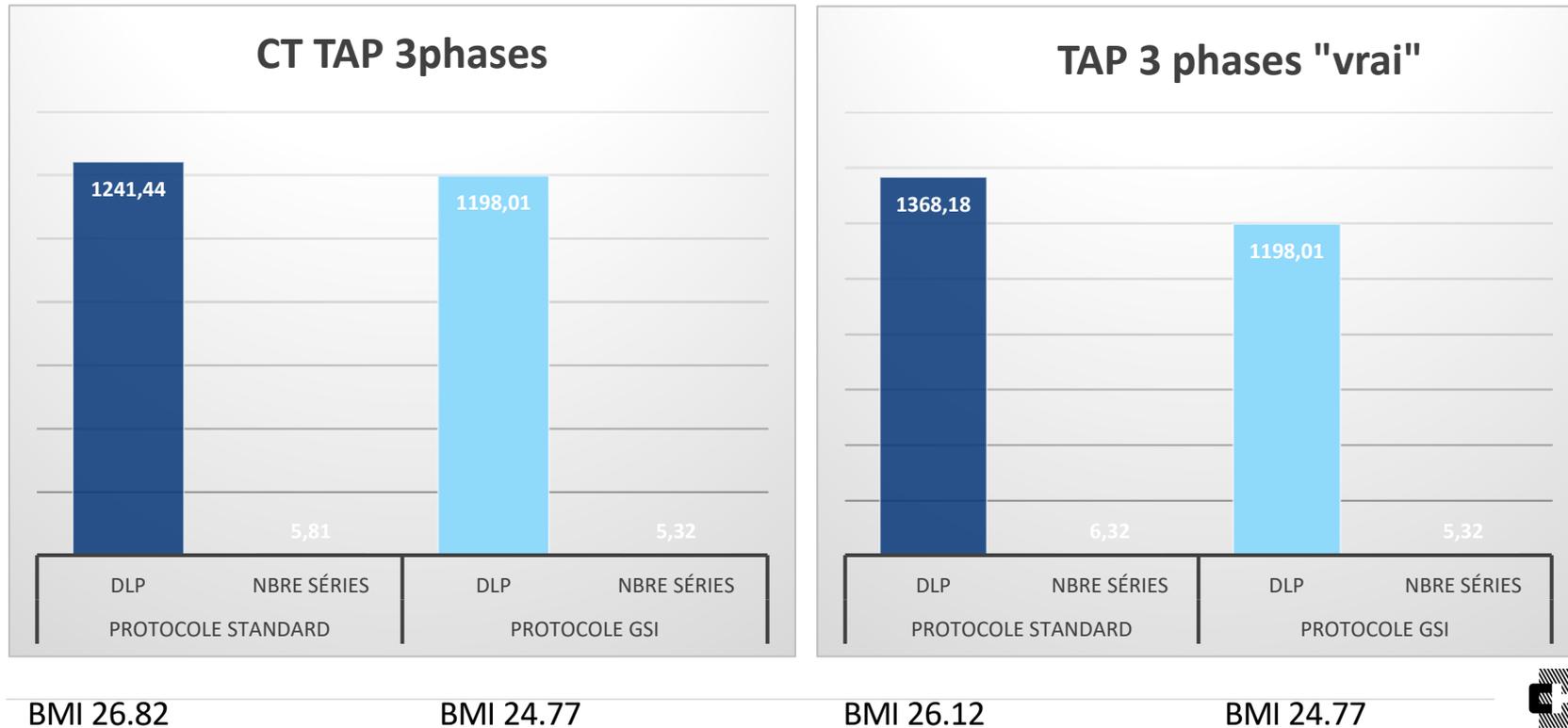
CT Neck-TAP



BMI 25.83

BMI 24.47

CT TAP 3 phases liver



CT

Oversize patients



Brain centering study by MTRA

Context

Objectify our current practice by:

- Centering an anatomical region with little anatomical variation:

BRAIN

- Use of a tool allowing reproducibility:

DOSEWATCH

Context

Êtes-vous satisfait de la qualité de l'image ?



Présentation de l'examen

Informations détaillées sur l'examen

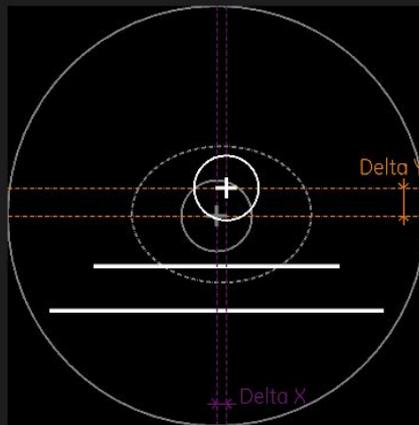
Vue SSDE

Évaluation qualité

Commentaires

Informations cliniques

Déplacement hors isocentre



Delta X: **22.36mm**

Delta Y: **62.73mm**

HAUTEUR DE LA TABLE | 209.50 mm

LARGEUR MAX. DU PATIENT | 406.91 mm

ÉPAISSEUR MAX. DU PATIENT | 307.64 mm



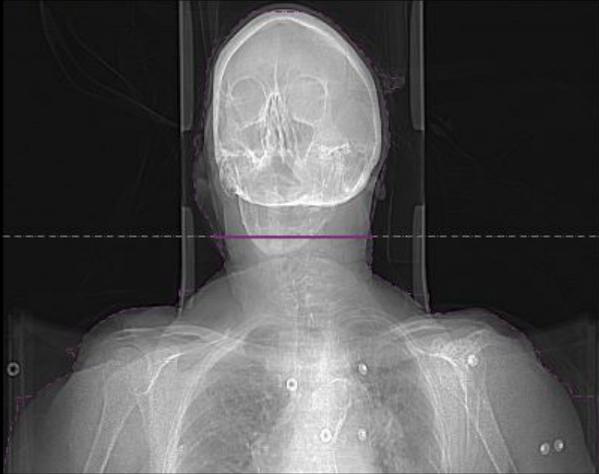
Patient

Contour du patient

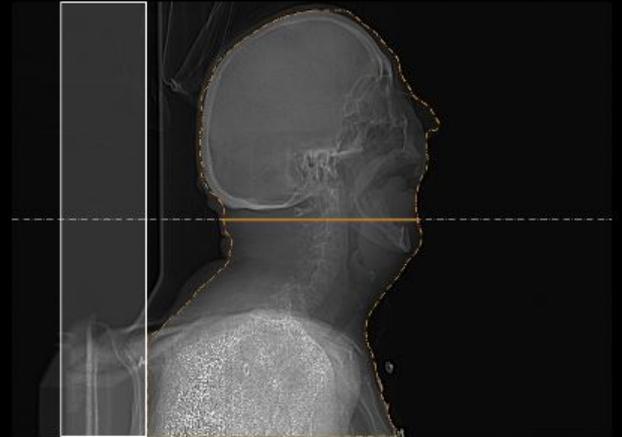
Phantom

IN PRACTICE

LAT : 126.00 mm

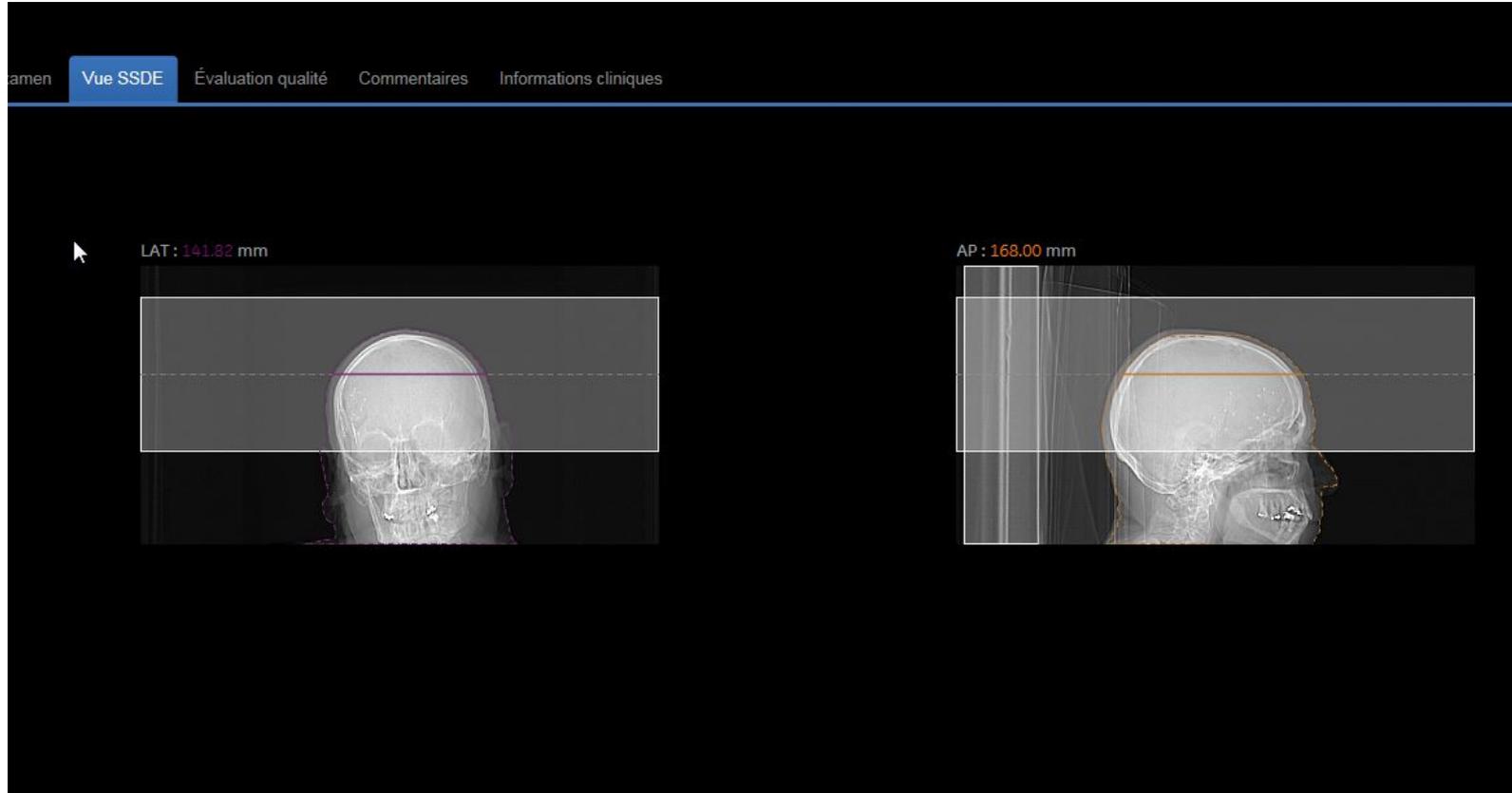


AP : 157.09 mm



E + VEO

IN PRACTICE



RESULTS : different support used

CT 07

CT 05

Head holder	Foam head cushion		Head holder	Foam head cushion
26%	74%		1%	99%

H.H	F.H.C
14%	86%

Head holder	Foam head cushion		Head holder	Foam head cushion
31%	69%		5%	95%

H.H	F.H.C
18 %	82 %

Êtes-vous satisfait de la qualité de l'image ?



Présentation de l'examen

Informations détaillées sur l'examen

Vue SSDE

Évaluation qualité

Commentaires

Informations cliniques



2 - - v

SSDE : **52.31** mGy

CTDI_{vol} : **51.79** mGy

SCAN RANGE | **I50.25 - S109.493**

PHANTOM | **HEAD**

PROTOCOLE | **1.1 CERVEAU**

POSITION DU PATIENT | **HFS**

DLP | **853.98 mGy.cm**

LAT = **141.27 mm**

AP = **174.55 mm**

LAT + AP = **315.82 mm**

EFFECTIVE DIAMETER = **15.70 cm**

f_{SSDE} = **1.01**

LAT : 141.27 mm



AP : 174.55 mm



Êtes-vous satisfait de la qualité de l'image ?



Présentation de l'examen

Informations détaillées sur l'examen

Vue SSDE

Évaluation qualité

Commentaires

Informations cliniques



2 - NATIF

SSDE : **56.04** mGy

CTDI_{vol} : **53.37** mGy

SCAN RANGE | 10.75 - S134.25

PHANTOM | HEAD

PROTOCOLE | 1.8 ANGIO-CT POLYGONE WILLIS + VEO

POSITION DU PATIENT | HFS

DLP | 747.23 mGy.cm

LAT = 124.91 mm

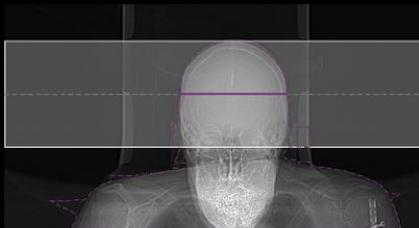
AP = 170.73 mm

LAT + AP = 295.64 mm

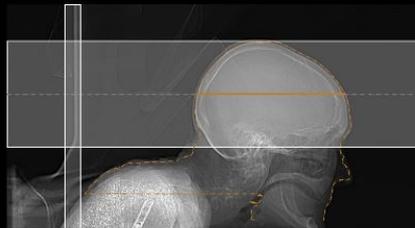
EFFECTIVE DIAMETER = 14.60 cm

f_{SSDE} = 1.05

LAT: 124.91 mm



AP: 170.73 mm



RESULTS

Avant

	% Use	R/L	A/P	Axis
Head holder	16 %	4.5	10.99	89 %
Foam head cushion	86 %	8.43	8.46	45 %

Après

	% Use	R/L	A/P	Axis
Head holder	18 %	2.58	8.78	83 %
Foam head cushion	82 %	8.58	8.58	59 %

Examen CT

2018-02-14 23:17

1800052989 CT CERVEAU 1.2 1.01 CERVEAU STD 22.49
N° d'accès Description de l'examen Protocole IMC

FORRER BARBARA 324041 1970-09-19 F
Nom ID patient Date de naissance Sexe

Êtes-vous satisfait de la qualité de l'image ?  

Remarque : le DLP total est la valeur de référence. La somme des DLP de la série peut différer du DLP total.

Présentation de l'examen Informations détaillées sur l'examen **Vue SSDE** Évaluation qualité Commentaires Informations cliniques



2 - Axial 5/5 STD

SSDE : 40.63 mGy

CTDI_{vol} : 45.14 mGy

SCAN RANGE | S26.523 - S181.523
PHANTOM | HEAD
PROTOCOLE | 1.2 1.01 CERVEAU STD
POSITION DU PATIENT | HFS
DLP | 722.28 mGy.cm

LAT = 157.82 mm
AP = 218.27 mm

LAT + AP = 376.09 mm
EFFECTIVE DIAMETER = 18.56 cm
f_{SSDE} = 0.90

LAT : 157.82 mm



AP : 218.27 mm



Êtes-vous satisfait de la qualité de l'image ?



Présentation de l'examen

Informations détaillées sur l'examen

Vue SSDE

Évaluation qualité

Commentaires

Informations cliniques



2 - NATIF

SSDE : **53.90** mGy

CTDI_{vol} : **53.37** mGy

SCAN RANGE | **I10.75 - S144.25**

PHANTOM | **HEAD**

PROTOCOLE | **1.8 ANGIO-CT POLYgone WILLIS + VEO**

POSITION DU PATIENT | **HFS**

DLP | **853.98 mGy.cm**

LAT = **144.55 mm**

AP = **177.82 mm**

LAT + AP = **322.36 mm**

EFFECTIVE DIAMETER = **16.03 cm**

f_{SSDE} = **1.01**

LAT : **144.55 mm**

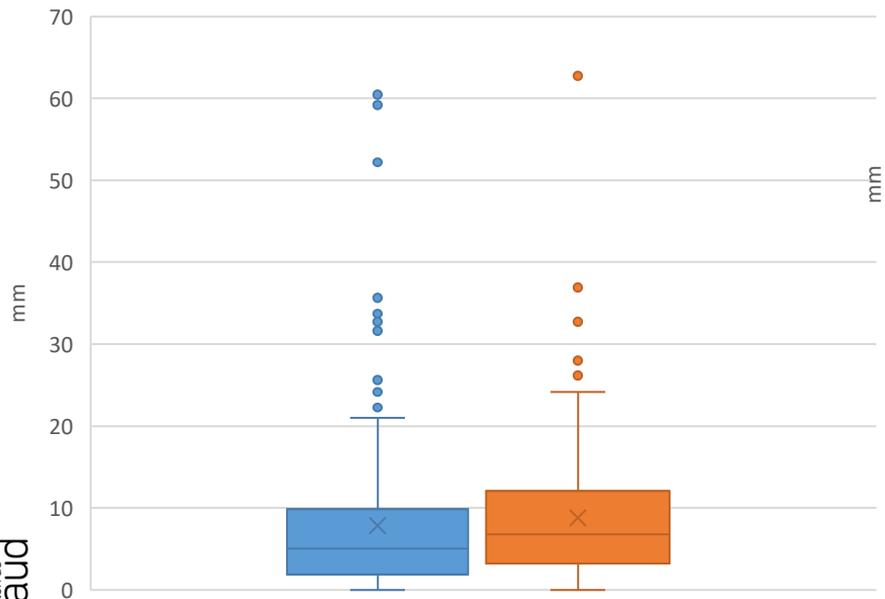


AP : **177.82 mm**



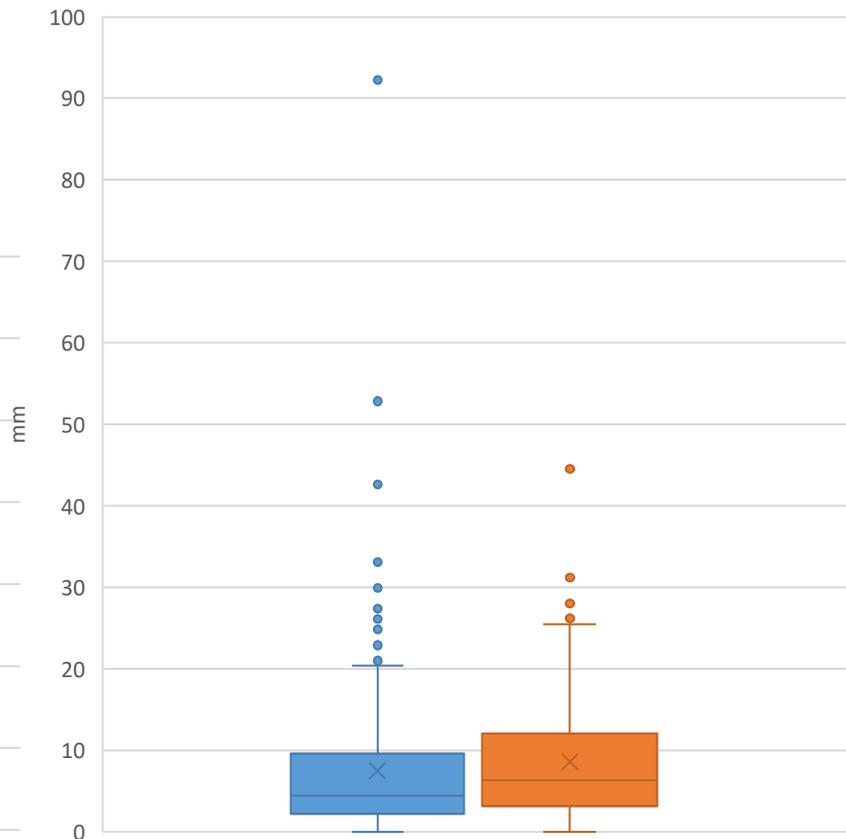
Before Workshop

■ centrage G/D ■ centrage A/P



After Workshop

■ centrage G/D ■ centrage A/P



Fluoroscopy

Justification:
Interventionnal
procedure and risk

Not only interventionnal
radiologists

DoseWatch for Interventional Radiology

Dose control for patient undergoing interventional Radiology (Car, RNRX, Vasc, Visc)

Time of fluoroscopy $> 90\text{min}$

Kair $> 5\text{Gy}$

=> Alert to the interventional practitioner in charge of the case

Examen CV/IR

2018-05-04 10:10

RPAK: 6793.45 mGy

Pire RPAK: 5478.21 mGy

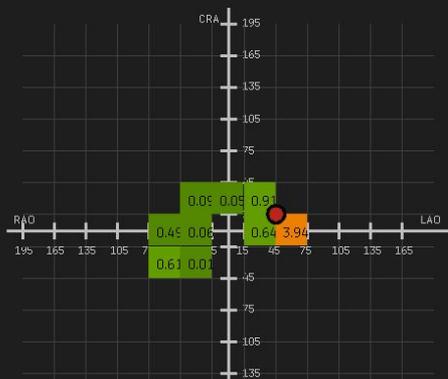
Protocole	Mode d'acquisition
	FLUORO
	RECORD

Afficher 10 entrées

Êtes-vous satisfait de la qualité de l'image ?



Cartographie de répartition de la dose cumulée



Informations dosimétriques

RPAK : 451680.00 mGy.cm

K_{air} : 6145.58 mGy

Durée totale : 6596 s

Temps de mesure : 610 s

La valeur DAP peut ne contenir qu'une valeur DAP image en fonction de l'équipement utilisé.

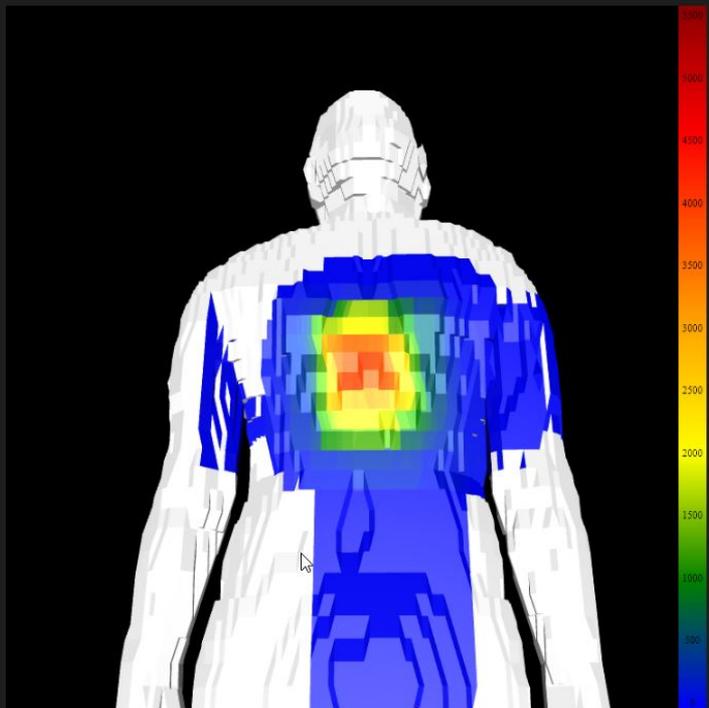
Informations relatives à l'examen

Nombre total de runs de l'enregistrement :12
Nombre total d'expositions :290
Durée totale de fluoroscopie :3751 s

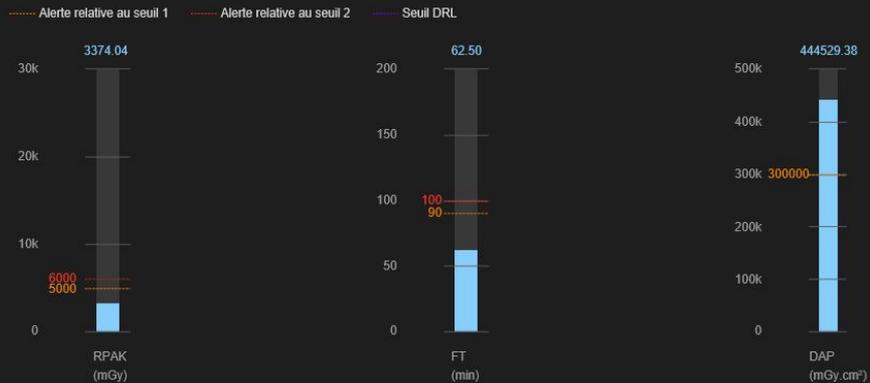
DAP TOTAL :444529.38 mGy.cm²
RPAK :3374.04 mGy
Dose maximale à la peau :4030.27 mGy

[Outil interactif de correspondance de dose à la peau](#)

Correspondance de dose à la peau (mGy)



Jauge



Tous les examens

Dose de l'examen	Dose cumul.	Infos cliniques	Date et heure ↑	Modalité	N° d'accès	ID patient	Description de l'examen
○	○		2020-11-17 09:20	CT	2000222323	648619	CT STEREOTAXIE
○	○		2020-11-17 07:56	CV/IR	2000224529	648619	Intervention RAD neuro
○	○		2020-02-25 13:29	CV/IR	2000047772	648619	Intervention RAD neuro
⚠	○		2020-01-27 12:21	CV/IR	2000015590	648619	Intervention RAD neuro
○	○		2020-01-16 15:03	CT	2000030748	648619	ANGIO-CT CERVEAU
○	○		2020-01-12 11:02	CT	2000027812	648619	ANGIO-CT CERVEAU
○	○		2020-01-10 00:14	CT	2000026398	648619	ANGIO-CT CERVEAU
○	○		2020-01-09 10:50	CV/IR	2000025643	648619	Intervention RAD neuro
○	○		2020-01-05 15:51	CT	2000021582	648619	ANGIO-CT CERVEAU
○	○		2020-01-03 09:00	CT	2000020647	648619	CT CERVEAU

Afficher 10 entrées

1 - 10 sur 14 ← 1 2 →

Historique de dose cumulée

Modalité	3 derniers mois	Antérieur à 3 mois	Total
CT DLP (mGy.cm)	719.53	14117.32	14836.85
CV/IR K _{eff} (mGy)	85.93	7460.94	7546.88
CV/IR DAP (mGy.cm ²)	14437.94	583960.79	598398.74
Médecine nucléaire Dose efficace (mSv)	0	0	0

Afficher 10 entrées

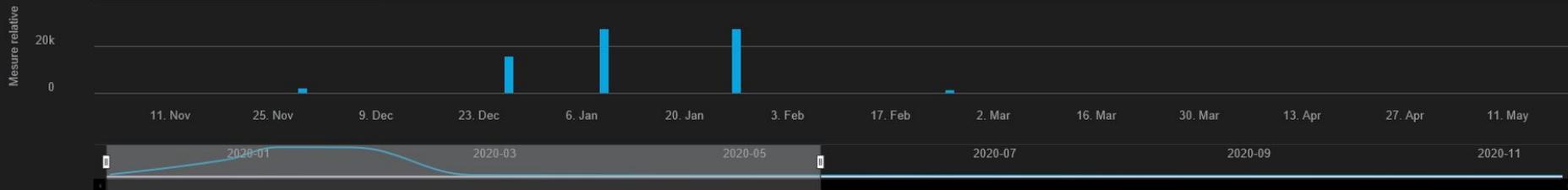
1 - 4 sur 4 ← 1 →

Chronologie

1m 3m 6m YTD 1y All

CT (8) CV/IR (6) Médecine nucléaire (0)

From 2019-10-31 To 2020-05-20



Clarity

Used to demonstrate
technologic
improvement

**2015 :
Upgrade
Allura Philips
with Clarity**

Detector set up for image visualisation
et post processing (spacial image
filtration)

Filtration Cu

Lower mA

Possibility to use small focal spot

Short pulses (except for side images
of abdomen and chest)

Clinical practice analysis

Collecting dose tool (DoseWatch™)

august 2013 and june 2017

Brain procedure : selective angioplasty

700 exams collected

Cardiac procedure : coronary angiography

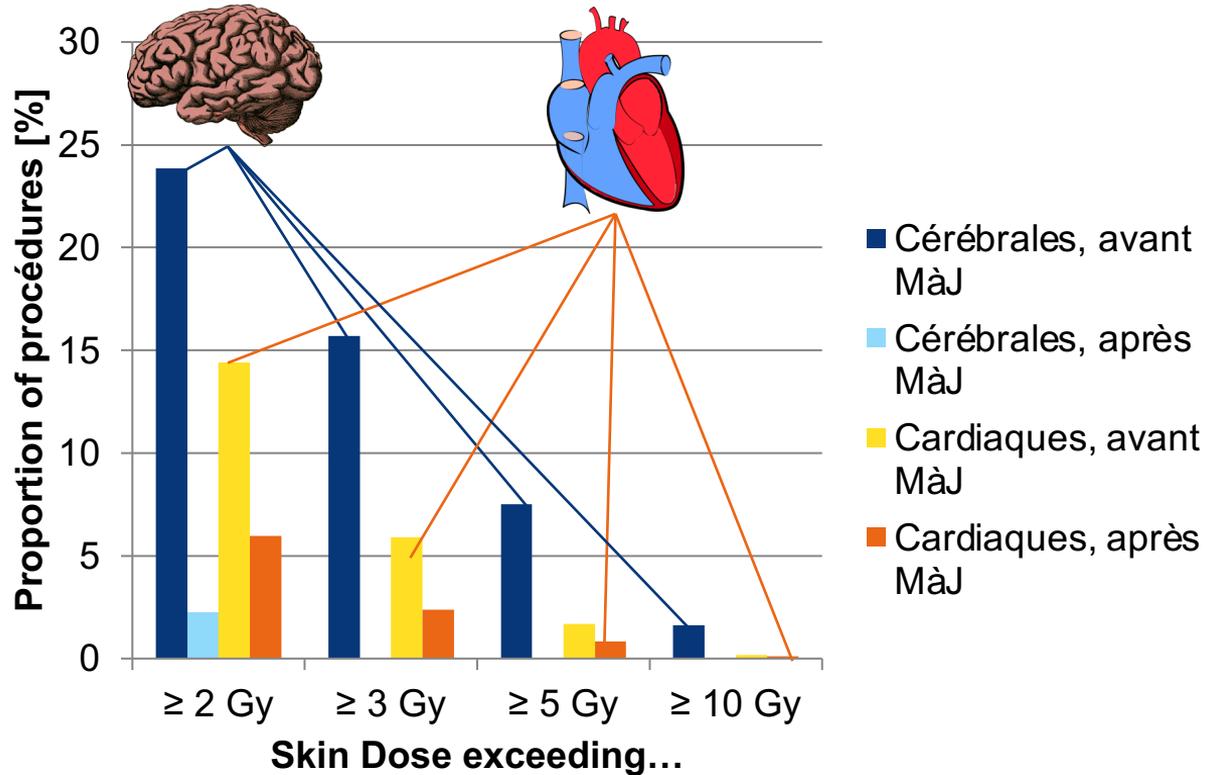
3300 exams collected

Data analysis :

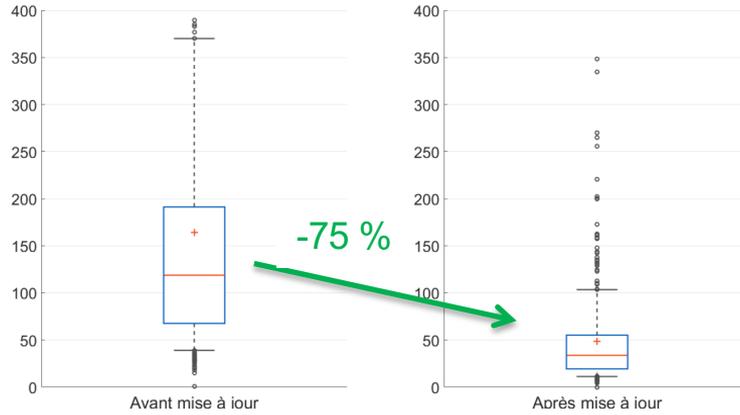
K_{air} et P_{KA} (burn risk resp. stochastic risks)

Fluoroscopy time (complexity of the procedure)

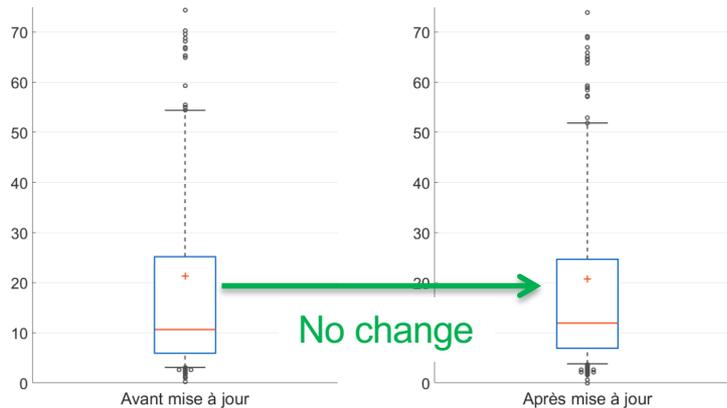
Patient exposure : burn risks (K_{air})



Brain Procédures

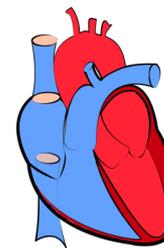


Patient Dose

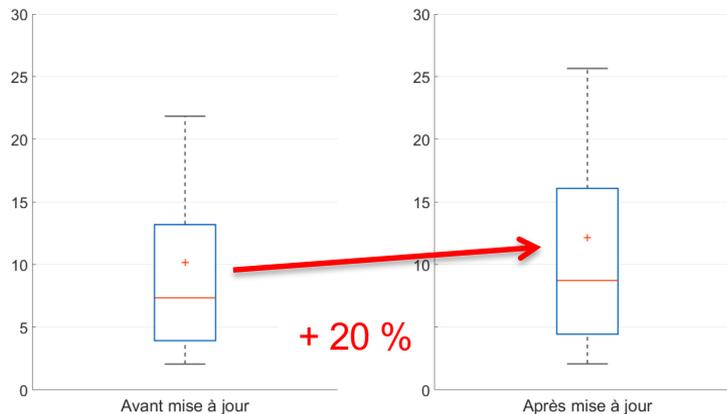
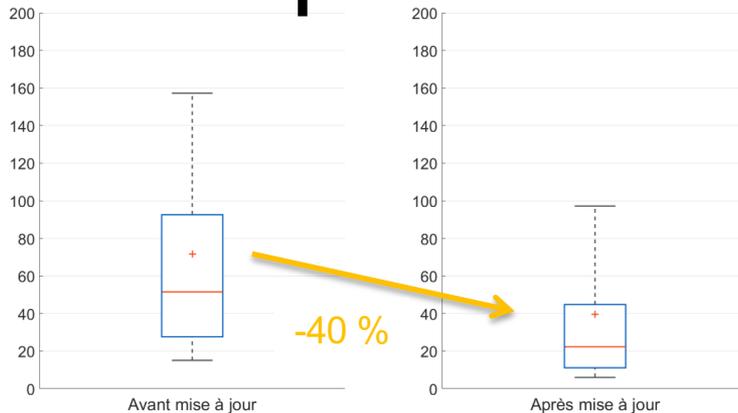


Fluoroscopy time

Cardiac procedures



Patient Dose



Fluoroscopy time

Something affect
Doctors'practice

To Do List...

OR : 2-3 representative exams ?

Master : Interventionnal procedures NRD
(abdomen, brain,...)

Having a connexion between all institutes for efficient follow-up

Work in progress....

Thank you !