Comment améliorer la détection des adénomes coliques ?

Apport de l'IA

David KARSENTI, clinique Paris-BERCY, FRANCE

Oc Santé CLINIQUE PARIS-BERCY Médecine, Chirurgie

Pôle Digestif Paris Bercy

Conflits d'intérêt

Olympus, Medtronic, Norgine

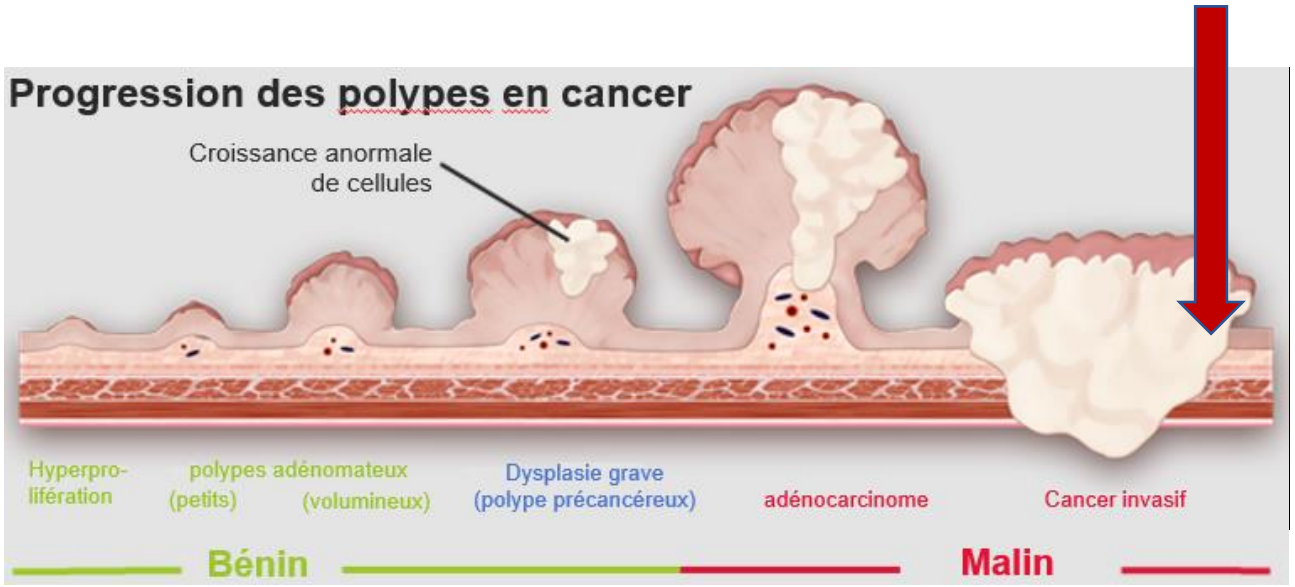
Alfasigma, Fujifilm

Consultant

Invitations congrès

Séquence Adénome-Cancer colorectal

COLONOSCOPIE



Introduction

- L'intelligence artificielle (IA) a été développée pour améliorer la vision humaine pour le dépistage des polypes
- Sujet « à la mode » dans le monde ces dernières années
- Récemment évalués par de nombreux RCT et semble augmenter d'environ 10% le TDA (ou ADR)[1,2]
- Aucune donnée disponible « en vie réelle »(en routine en centre non-academique)

1- Larsen SLV, et al. *DEN Open* 2022; 2: e109
2- Hassan C, et al. *Gut* 2020; 69: 799-800

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	Country	RCT	Population	N	System	ADR
Su JR GIE 2020						
Gong D Lancet GH 2020						
Wang P Lancet GH 2020						
Wang P Gastroenterology 2020						
Liu P TherapAdv Gastro 2020						
Repici A Gastroenteology 2020						
Kamba S J Gastroenterol 2020						
Glissen Brown JR Clin Gast Heoat 2022						
Repici A Gut. 2022						
Rondonotti E Endoscopy 2022						
Shaukat A Gv 2022						
Karsenti D Lancet GH 2023						
XU H Clin GH 2023						
Wei MT Am J G 2023						

14 RCT en 2 ans !

	Country	RCT	Population	N	System	ADR
Su JR GIE 2020	China					
Gong D Lancet GH 2020	China					
Wang P Lancet GH 2020	China					
Wang P Gastroenterology 2020	China					
Liu P TherapAdv Gastro 2020	China					
Repici A Gastroenteology 2020	Italy					
Kamba S J Gastroenterol 2020	Japan					
Glissen Brown JR Clin Gast Heoat 2022	US					
Repici A Gut. 2022	Italy					
Rondonotti E Endoscopy 2022	Italy					
Shaukat A Gy 2022	US					

	Country	RCT	Population	N	System	ADR
Su JR GIE 2020	China					
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Kamba S J Gastroenterol 2020	Japan					
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Repici A Gut. 2022	Italy					
Rondonotti E Endoscopy 2022	Italy					
Shaukat A Gy 2022	US					

	Country	RCT	Population	N	System	ADR
Su JR GIE 2020		Mono. Acad.				
Gong D Lancet GH 2020		Mono Acad.				
Wang P Lancet GH 2020		Mono. Acad.				
Wang P Gastroenterology 2020		Mono. **Tandem** Acad.				
Liu P TherapAdv Gastro 2020		Mono Acad.				
Repici A Gastroenteology 2020		Multi (3) Acad.				
Kamba S J Gastroenterol 2020		Multi (4) **Tandem** Acad.				
Glissen Brown JR Clin Gast Heoat 2022		Multi (4) **Tandem** Acad.				
Repici A Gut. 2022		Mono senior vs junior				
Rondonotti E Endoscopy 2022		Muti (5) Acad.				
Shaukat A Gy 2022		Mixte 5 centres				

	Country	RCT	Population	N	System	ADR
Su JR GIE 2020		Mono. **Acad.**				
Gong D Lancet GH 2020		Mono **Acad.**				
Wang P Lancet GH 2020		Mono. **Acad.**				
Wang P Gastroenterology 2020		Mono. **Tandem** **Acad.**				
Liu P TherapAdv Gastro 2020		Mono **Acad.**				
Repici A Gastroenteology 2020		Multi (3) **Acad.**				
Kamba S J Gastroenterol 2020		Multi (4) **Tandem** **Acad**.				
Glissen Brown JR Clin Gast Heoat 2022		Multi (4) **Tandem** **Acad.**				
Repici A Gut. 2022		Mono senior vs junior **Acad**				
Rondonotti E Endoscopy 2022		Muti (5) **Acad.**				
Shaukat A Gy 2022		Multi (5) Mixt				

	Country	RCT	Population	N	System	ADR
Su JR GIE 2020				659		
Gong D Lancet GH 2020				704		
Wang P Lancet GH 2020				962		
Wang P Gastroenterology 2020				369		
Liu P TherapAdv Gastro 2020				790		
Repici A Gastroenteology 2020				685		
Kamba S J Gastroenterol 2020				358		
Glissen Brown JR Clin Gast Heoat 2022				232		
Repici A Gut. 2022				660		
Rondonotti E Endoscopy 2022				800		
Shaukat A Gy 2022				1359		

	Country	RCT	Population	N	System	ADR
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Gong D Lancet GH 2020				704		
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Repici A Gut. 2022				660		
Rondonotti E Endoscopy 2022				800		
Shaukat A Gy 2022				**1359**		

	Country	RCT	Population	N	System	ADR
Su JR GIE 2020					Personal	
Gong D Lancet GH 2020					Endoangel	
Wang P Lancet GH 2020					EndoScreener; Wision AI, Shanghai, China	
Wang P Gastroenterology 2020					EndoScreener, Shanghai Wision AI Co., Ltd. China	
Liu P TherapAdv Gastro 2020					EndoScreener, Shanghai Wision AI Co., Ltd. China	
Repici A Gastroenteology 2020					GI Genius, Medtronic	
Kamba S J Gastroenterol 2020					Perso	
Glissen Brown JR Clin Gast Heoat 2022					EndoScreener, Shanghai Wision AI, China	
Repici A Gut. 2022					Genius	
Rondonotti E Endoscopy 2022					Cadeye	
Shaukat A Gy 2022					Personal	

	Country	RCT	Population	N	System	ADR
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Wang P Lancet GH 2020					EndoScreener; Wision AI, Shanghai, China	
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Liu P TherapAdv Gastro 2020					EndoScreener, Shanghai Wision AI Co., Ltd. China	
Repici A Gastroenteology 2020					**GI Genius, Medtronic**	
Kamba S J Gastroenterol 2020					Perso	
Glissen Brown JR Clin Gast Heoat 2022					EndoScreener, Shanghai Wision AI, China	
Repici A Gut. 2022					**Genius**	
Rondonotti E Endoscopy 2022					Cadeye	
Shaukat A Gy 2022					Personal	

	Country	RCT	Population	N	System	ADR
Su JR GIE 2020						**28.9% vs 16.5%**, p<0.001
Gong D Lancet GH 2020						**16% vs 8%** OR 2·30 [95CI 1·40–3·77], p=0·0010
Wang P Lancet GH 2020						**34% vs 28%** OR 1·36 [95CI 1·03–1·79], p=0·030
Wang P Gastroenterology 2020						**42.39% vs. 35.68%,** P=0.186
Liu P TherapAdv Gastro 2020						**29.01% vs 20.91%** OR = 1.546, 95% CI 1.116–2.141, p = 0.009
Repici A Gastroenteology 2020						**54.8% vs 40.4%** [RR], 1.30; 95% CI, 1.14–1.45
Kamba S J Gastroenterol 2020						First-pass ADR **64.5% vs 53.6%**; P = 0.036
Glissen Brown JR Clin Gast Heoat 2022						First-pass ADR **50.44% vs 43.64 %** P=0 .3091 SSL MR 7.14% [1/14] vs 42.11% [8/19]; P=0.0482
Repici A Gut. 2022						**53.3% vs 44.5%** RR 1.22 [95CI: 1.04 to 1.40] p<0.01 for non-inferiority , p=0.02 for superiority
Rondonotti E Endoscopy 2022						53.6 % vs. 45.3 % RR 1.18 [95CI 1.03–1.36]
Shaukat A Gy 2022						**47.8% vs 43.9%** P =0.065

	Country	RCT	Population	N	System	ADR	
Su JR GIE 2020						**28.9% vs 16.5%**, p<0.001	**+8.4%**
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Wang P Lancet GH 2020						**34% vs 28%** OR 1·36 [95CI 1·03–1·79], p=0·030	**+6%**
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Kamba S J Gastroenterol 2020						First-pass ADR **64.5% vs 53.6%**; P = 0.036	**+10.9%**
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Shaukat A Gy 2022						
	France	Spécifiquement en centre non-académique		Large >2000	GI Genius, Medtronic	

Étude COLO-GENIUS

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Médecine, Chirurgie

PBB
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Étude COLO-GENIUS

- Prospective monocentrique RCT **comparant**

CADe-assisted colonoscopy = IA (GI Genius™, Medtronic) **à la coloscopie standard colonoscopy**

- Objectif principal : **TDA** (pourcentage de coloscopies avec au moins un adénome)

- Critère d'inclusion :

  Tous les patients consécutifs agés ≥ 18 ans admis pour coloscopie

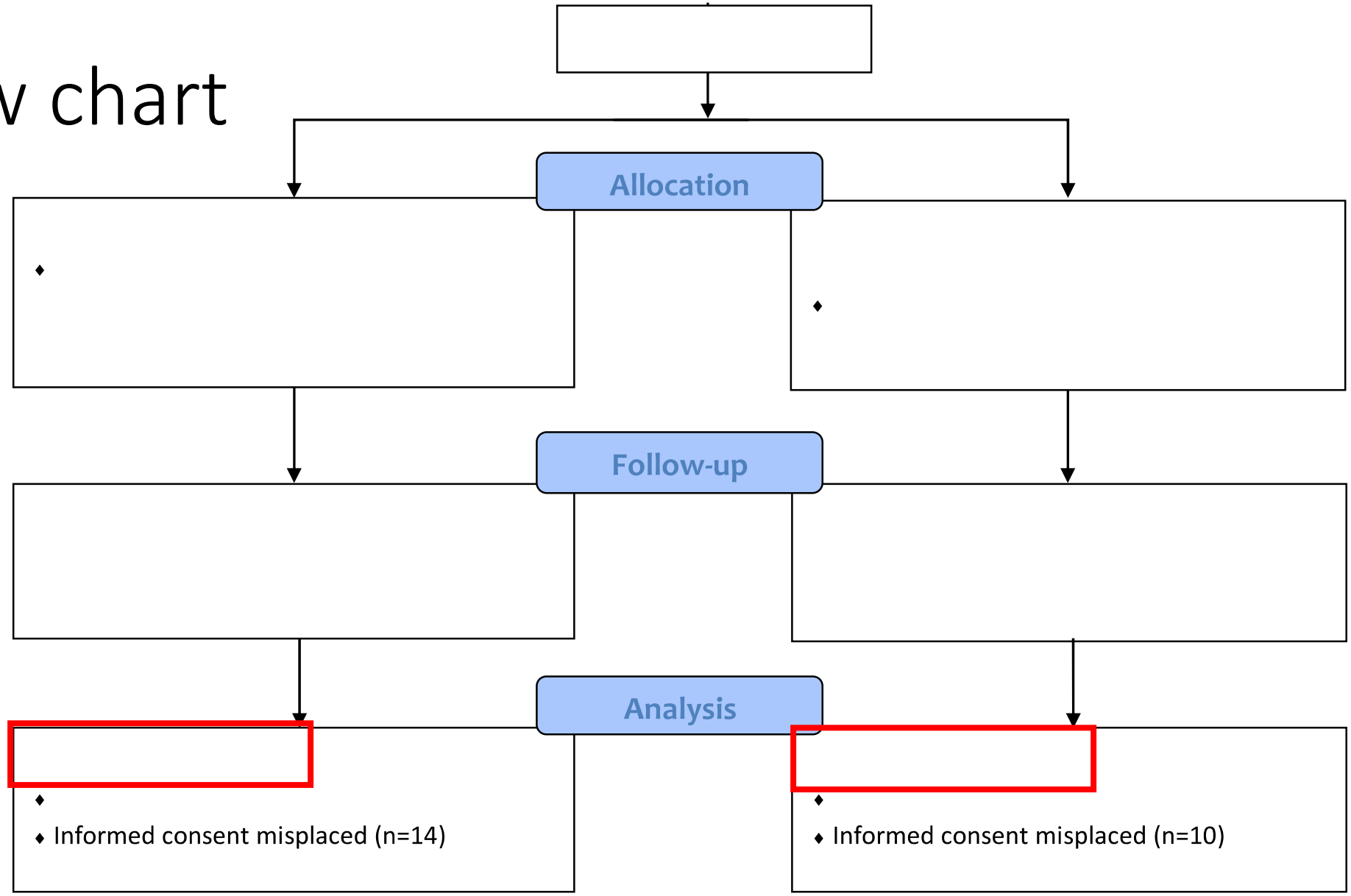
Étude COLO-GENIUS

- 20 endoscopistes experientés (6 femmes and 14 hommes)

- “faibles” detecteurs (TDA de base moyen < 25%)
- “moyens” detecteurs (TDA de base moyen entre 25% et 35%)
- “forts” detecteurs (TDA de base moyen > 35%)

définis dans le bras coloscopie standard

Flow chart



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Comparaison des groups standard et IA (CADe)

	Standard colonoscopy (n=1012)	CADe-assisted colonoscopy (n=1003)
Age, years	58·4 (11·8)	58·4 (11·4)
Gender		
Female	514 (50·8%)	522 (52·0%)
Male	498 (49·2%)	481 (48·0%)
Indication for colonoscopy		
Family history of polyp or cancer	176 (17·4%)	173 (17·2%)
Personal history of polyp or cancer	278 (27·5%)	249 (24·8%)
Individual screening*	163 (16·1%)	138 (13·8%)
Positive faecal immunochemical test	64 (6·3%)	79 (7·9%)
Haematochezia	94 (9·3%)	106 (10·6%)
Digestive symptoms	162 (16·0%)	164 (16·4%)
Other	75 (7·4%)	94 (9·4%)
BMI	25·8 (5·0)	25·7 (5·0)
Smoker (active or stopped <10 years ago)	180 (17·8%)	179 (17·8%)
Good quality preparation†	990 (97·8%)	983 (98·0%)

Data are n (%), median (IQR), or mean (SD). CADe=computer-aided detection. *In France, patients can go directly to the gastroenterologist for a colonoscopy (individual screening), or can take part in national screening by faecal immunochemical testing. †Boston Bowel Preparation Scale score of 6 or higher, with no subscore of less than 2.

***Table 1:* Baseline characteristics in the modified intention-to-treat population**

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Pourcentages / differences absolues

	Standard colonoscopy (n=1012)	CADe-assisted colonoscopy (n=1003)	Estimated mean absolute difference (95% CI)	p value
Adenoma detection rate	341/1012 (33·7%)	376/1003 (37·5%)	4·1 percentage points (0·0 to 8·1)*	0·051
Size of the largest adenoma				
≥1 cm	60/338 (17·8%)	71/374 (19·0%)	1·1 percentage points (−3·2 to 5·3)†	0·63
5–9 mm	84/338 (24·9%)	96/374 (25·7%)	0·7 percentage points (−2·0 to 3·3)†	0·63
<5 mm	194/338 (57·4%)	207/374 (55·3%)	−1·7 percentage points (−8·7 to 5·2)†	0·63
Polyp detection rate	414/1009 (41·0%)	451/1003 (45·0%)	4·3 percentage points (0·0 to 8·5)*	0·048
Advanced adenoma detection rate	77/1012 (7·6%)	93/1003 (9·3%)	1·7 percentage points (−0·8 to 4·1)*	0·18
Proximal serrated polyp detection rate	106/1012 (10·5%)	126/1003 (12·6%)	2·1 percentage points (−0·7 to 4·8)*	0·14
Mean number of adenomas per colonoscopy	0·71 (1·30)	0·89 (1·49)	0·17 (0·10 to 0·25)‡	<0·0001
Polyps per coloscopy	0·86 (1·23)	1·01 (1·37)	0·15 (0·07 to 0·24)‡	0·0002

Data are n/N (%) or mean (SD). CADe=computer-aided detection. *Computed from a mixed-effects logistic regression, including a random intercept at the endoscopist level. †Computed from a mixed-effects ordinal logistic regression, including a random intercept at the endoscopist level. ‡Computed from a mixed-effects Poisson regression, including a random intercept at the endoscopist level.

Table 2: **Primary outcome and secondary outcomes in the modified intention-to-treat population**

Pôle Digestif Paris Bercy

Pourcentages / differences absolues

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Data are n/N (%) or mean (SD). CADe=computer-aided detection. *Computed from a mixed-effects logistic regression, including a random intercept at the endoscopist level. †Computed from a mixed-effects ordinal logistic regression, including a random intercept at the endoscopist level. ‡Computed from a mixed-effects Poisson regression, including a random intercept at the endoscopist level.

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Variabilité de l'effet de l'IA sur chaque endoscopiste

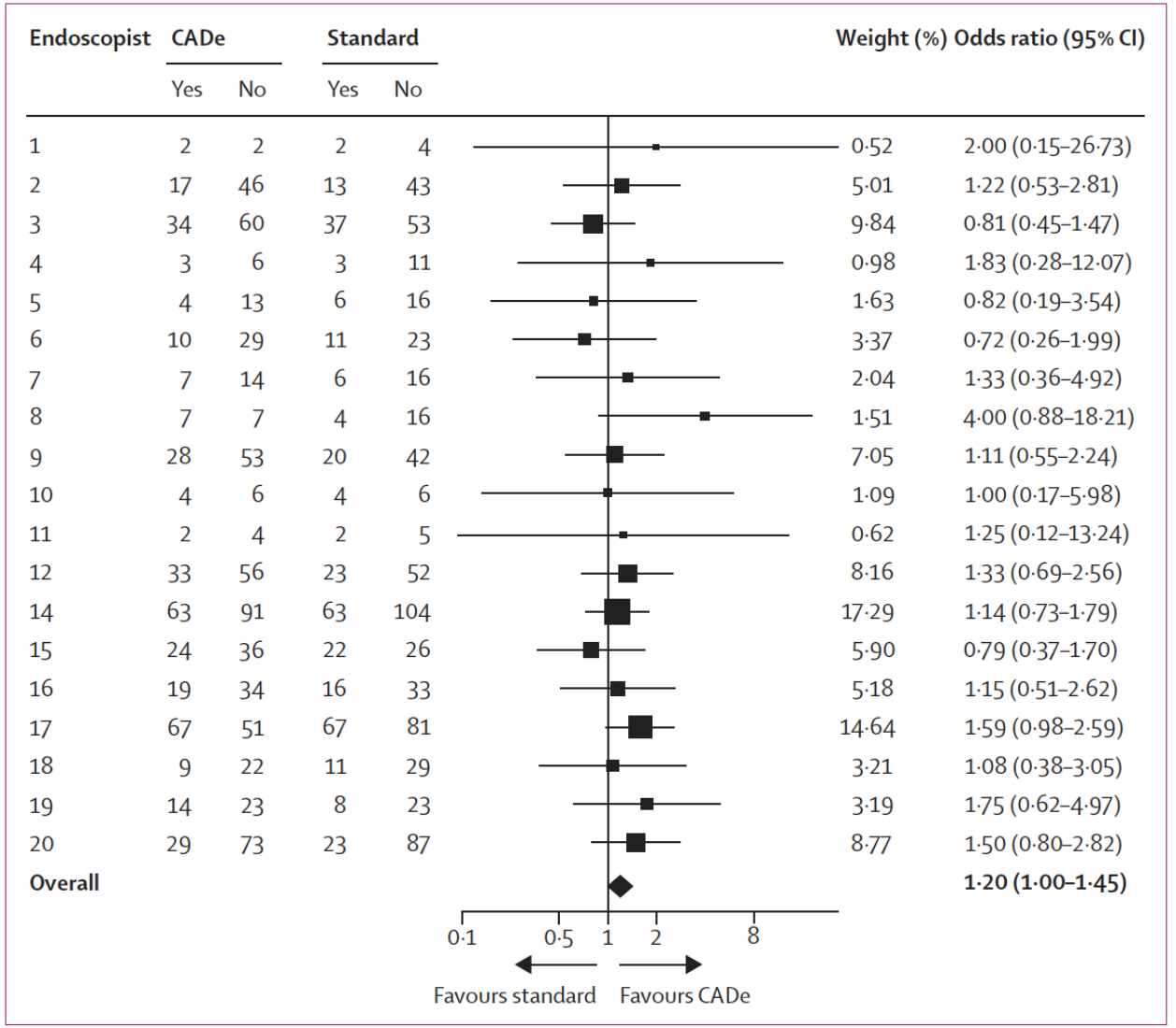

Figure 2: Effect of CADe on ADR for each endoscopist

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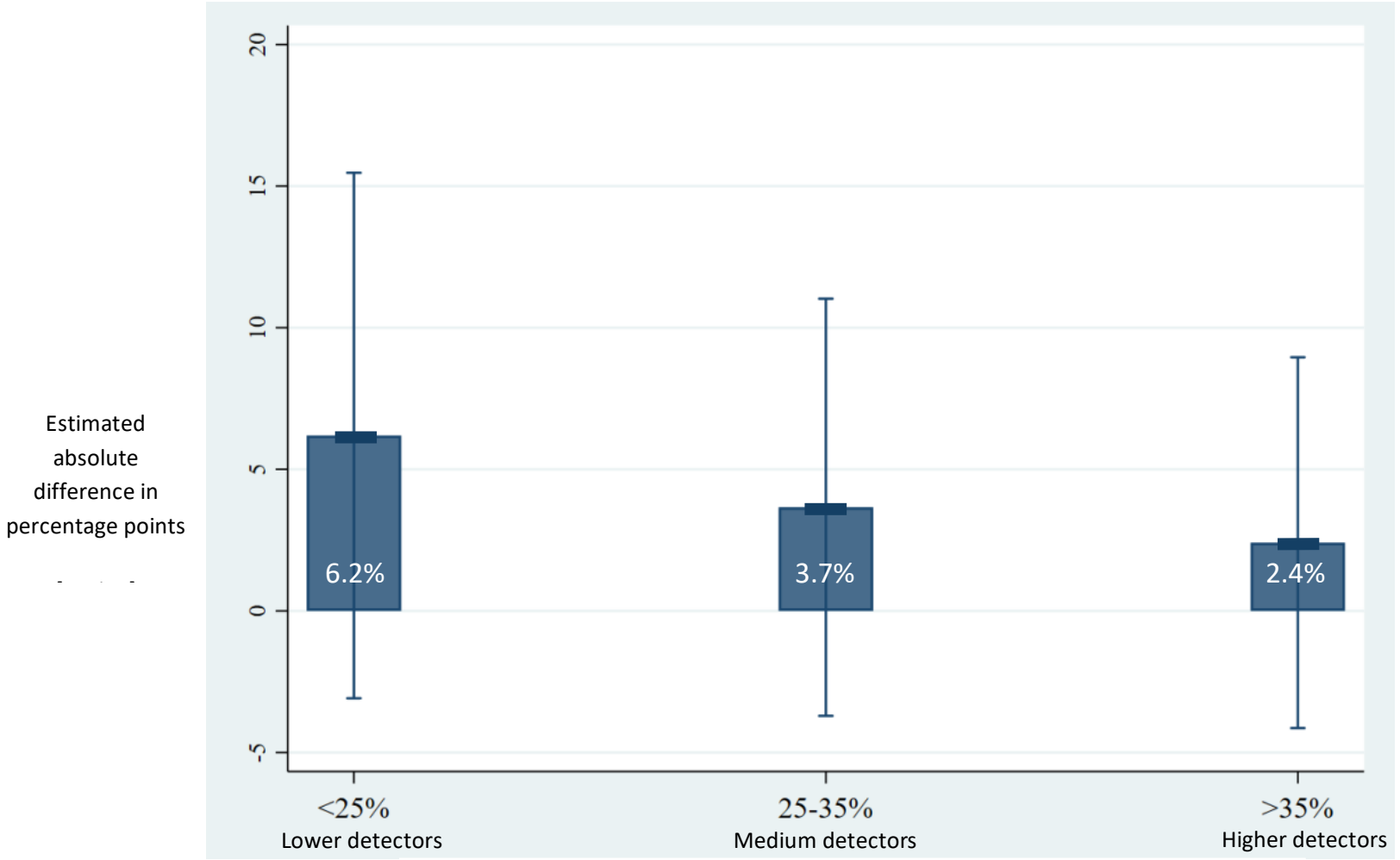
Amélioration du TDA grace à l'IA en fonction du TDA de base des détecteurs



Breakdown of the physicians involved in the study according to their basal ADR

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	Country	RCT	Population	N	System	ADR
Su JR GIE 2020						
Gong D Lancet GH 2020						
Wang P Lancet GH 2020						
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Shaukat A Gy 2022						
Karsenti D Lancet GH 2023	France	Mono. **Non acad.**	20 endoscopists Routine 18-90 yo	**2039**	GI Genius, Medtronic	**37.5% vs 33.7%** Mean abs. difference 4.1% (95% CI 0.0-8.1%), P=0.051

	Country	RCT	Population	N	System	ADR	
Su JR GIE 2020							
Gong D Lancet GH 2020							
Wang P Lancet GH 2020							
Wang P Gastroenterology 2020							
Liu P TherapAdv Gastro 2020							
Repici A Gastroenteology 2020							
Kamba S J Gastroenterol 2020							
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XU H Clin GH 2023	Chine	Multi Acad.	45-75 yo Screening: direct or FIT+	**3059**	Eagle-Eye [version 5.1] Xiamen Innovision, Xiamen, China	**ADR 39.9% vs 32.4%; P < .001** AdvADR 6.6% vs 4.9%; P= .041	**+7.5%**
Wei MT Am J G 2023	US	Multi (4) **Non acad.**	>45 ans Low risk	769	EndoVigilant	ADR = secondary objective **35.9 vs 37.2%,** p=0.774	

Conclusion de l'étude COLO-GENIUS

- Ce large RCT confirme l'impact positif de l'IA (GI Genius™) sur le TDA, l'APC et le TDP en routine, même en centres non-academiques

- **Suggère l'utilisation systématique de l'IA en coloscopie de dépistage**

- L'utilité de l'IA semble inversement proportionelle du TDA de base

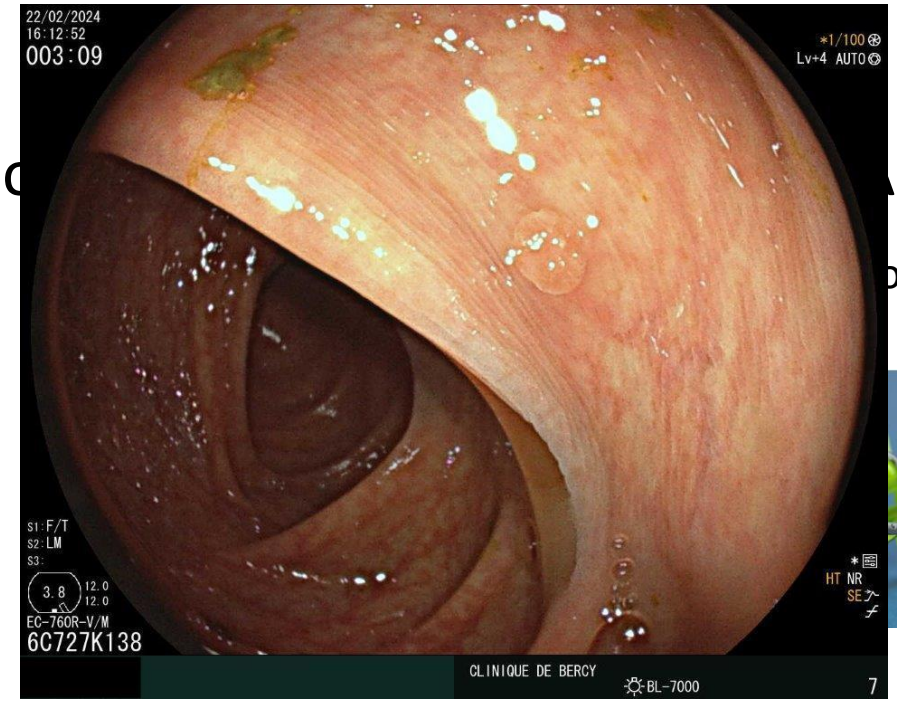
L’IA n’est pas le seul dispositif d’optimisation du TDA

Capuchons et augmentation de contraste

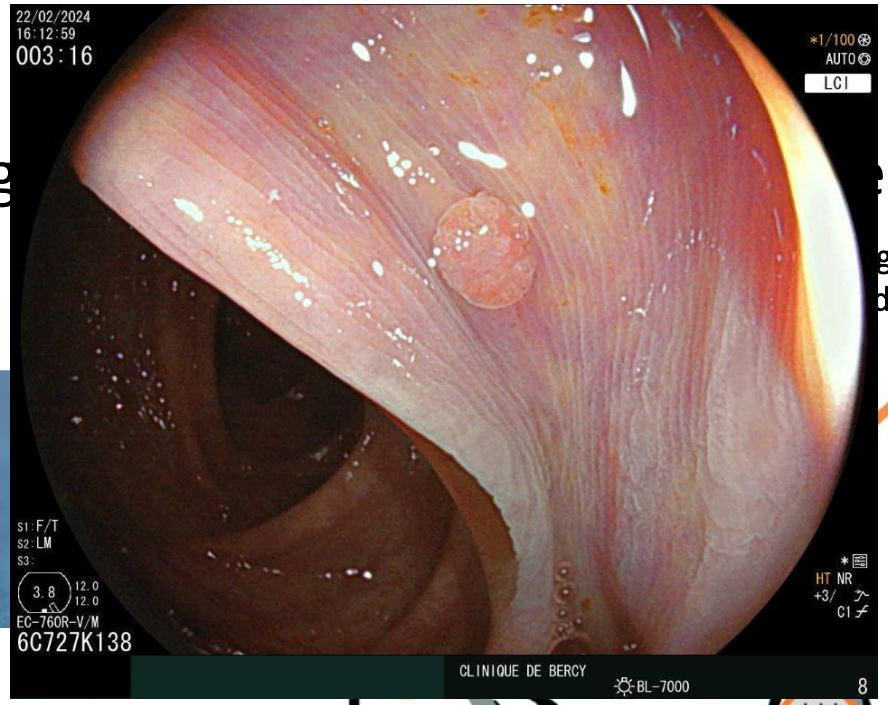
Autres dispositifs d'optimisation du TDA

- Endo … ug … e explorée

… ors … g to colonic location. … d colonoscopy; ECV-,



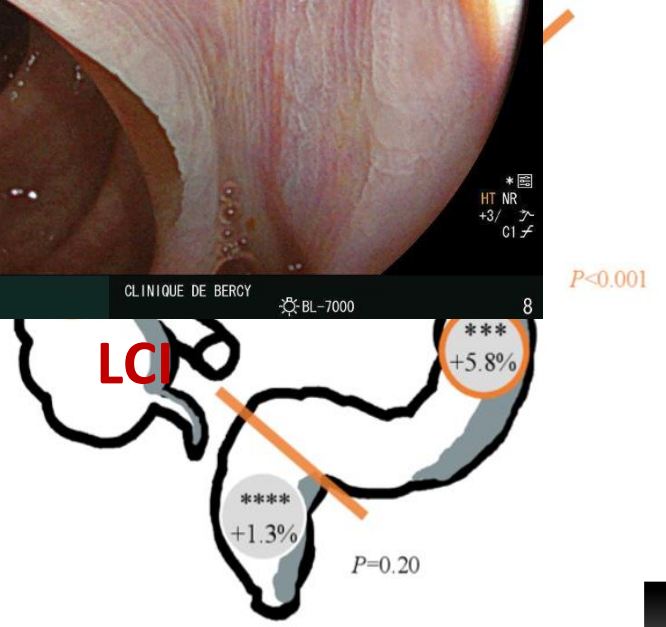
WLI



LCI

- **LCI**, Fujifilm[2,3] : Augmente le contraste e

↑TDA, ↓ AM



1. Karsenti D, et al. Gut. 2020 Dec;69(12):2159-2164.
2. Shinozaki S, et al. Dig Endosc. 2020 Sep;32(6):874-881
3. Wang J, et al. J Gastrointestin Liver Dis. 2022 Mar 19;31(1):67-73.

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IA (CADe) + ECV

	Country	RCT	Population	N	System	ADR
Spadaccini M Gy 2023	Internat. Italy + Switz.	Multi (6)	Routine screening	1316	(ECV + CADe) vs CADe alone **GI Genius Medtronic**	**49.6% vs 44.0%,** (RR, 1.12; 95% CI, 1.00-1.26; P = .04)
Ahmad A Endoscopy 2023	UK	Mono English National Health Service (NHS) BCSP center	UK screening program 8 screening-accredited endoscopists	614	#70 ECV in both groups CADe vs Standard **GI Genius Medtronic**	**71.4% vs. 65.0%;** P=0.09
Aniwan S GIE2023				1245	ECV vs CADe vs [ECV+CADe] **GI Genius Medtronic**	**ADR (P<.05) and AdvADR (P=.02) increase [in ECV+CADe]**

ECV + IA > IA seule

ECV + IA > Coloscopie standard sur le TDA et même le TDAv

IA + Systèmes d'augmentation de contraste

Pas encore de RCT

100% de sensibilité pour dépistage de polypes vus sur enregistrements vidéos [†]

[†] Neumann H, et al. Evaluation of novel LCI CAD EYE system for real time detection of colon polyps. PLoS One. 2021

Contribution de ces dispositifs

- L'IA augmente le TDA grace à une meilleure **vigilance de l'endoscopiste**
- Les systemes d'augmentation de contraste augmentent le TDA en **rendant visible l'invisible**
- L'Endocuff augmente le TDA en **augmentant la surface de muqueuse examinée**
- → Nous devons combiner ces dispositifs[†] !

[†] Karsenti D. Standard screening high-definition colonoscopy without any optimization device is no longer relevant: Time to move to optimized screening colonoscopy. Endosc Int Open. 2024;12:E463-E466

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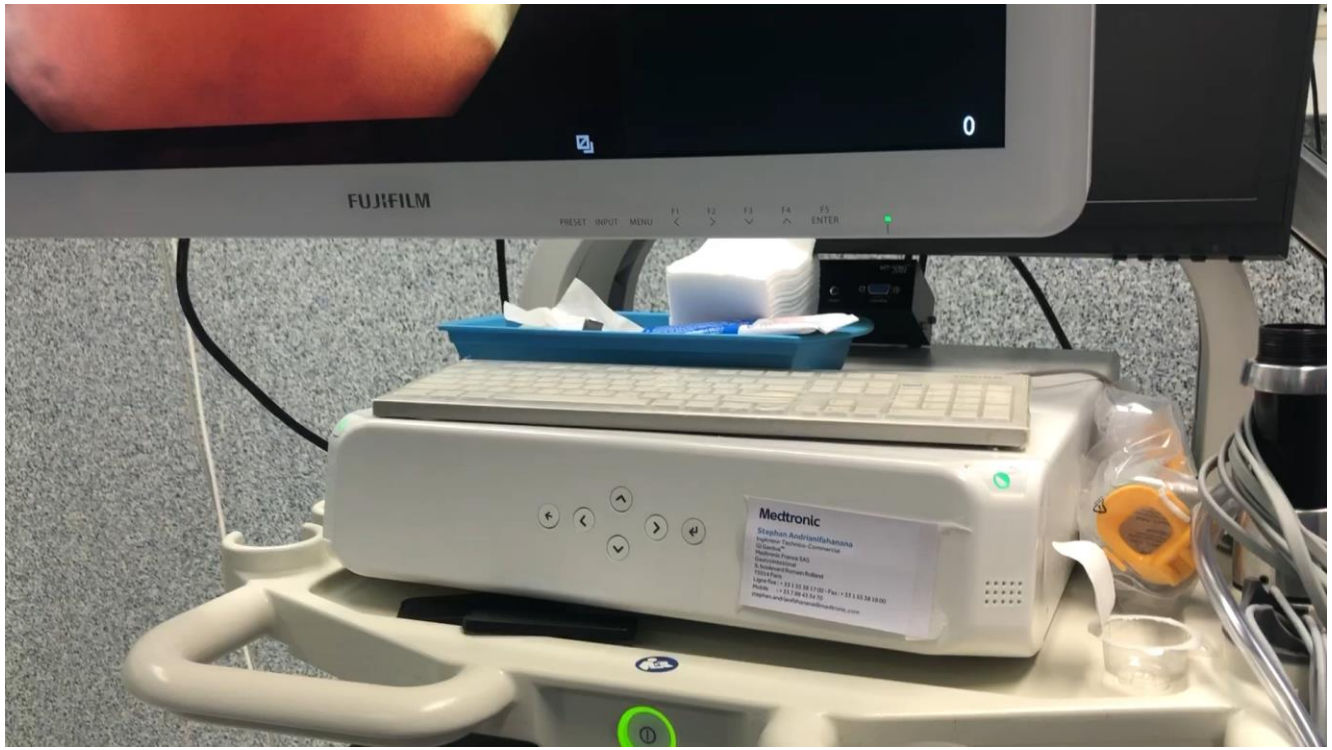
GI-Genius, un dispositif compact



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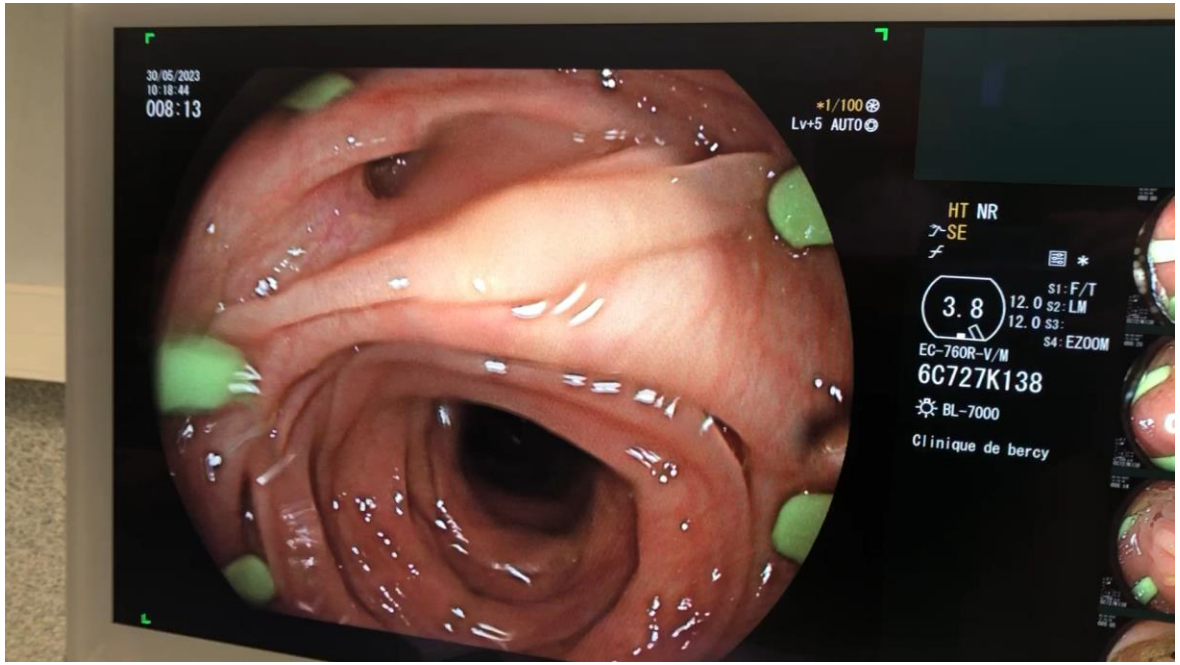
La coloscopie de dépistage optimisée

Combinaison de

IA + ECV + augmentation de contraste



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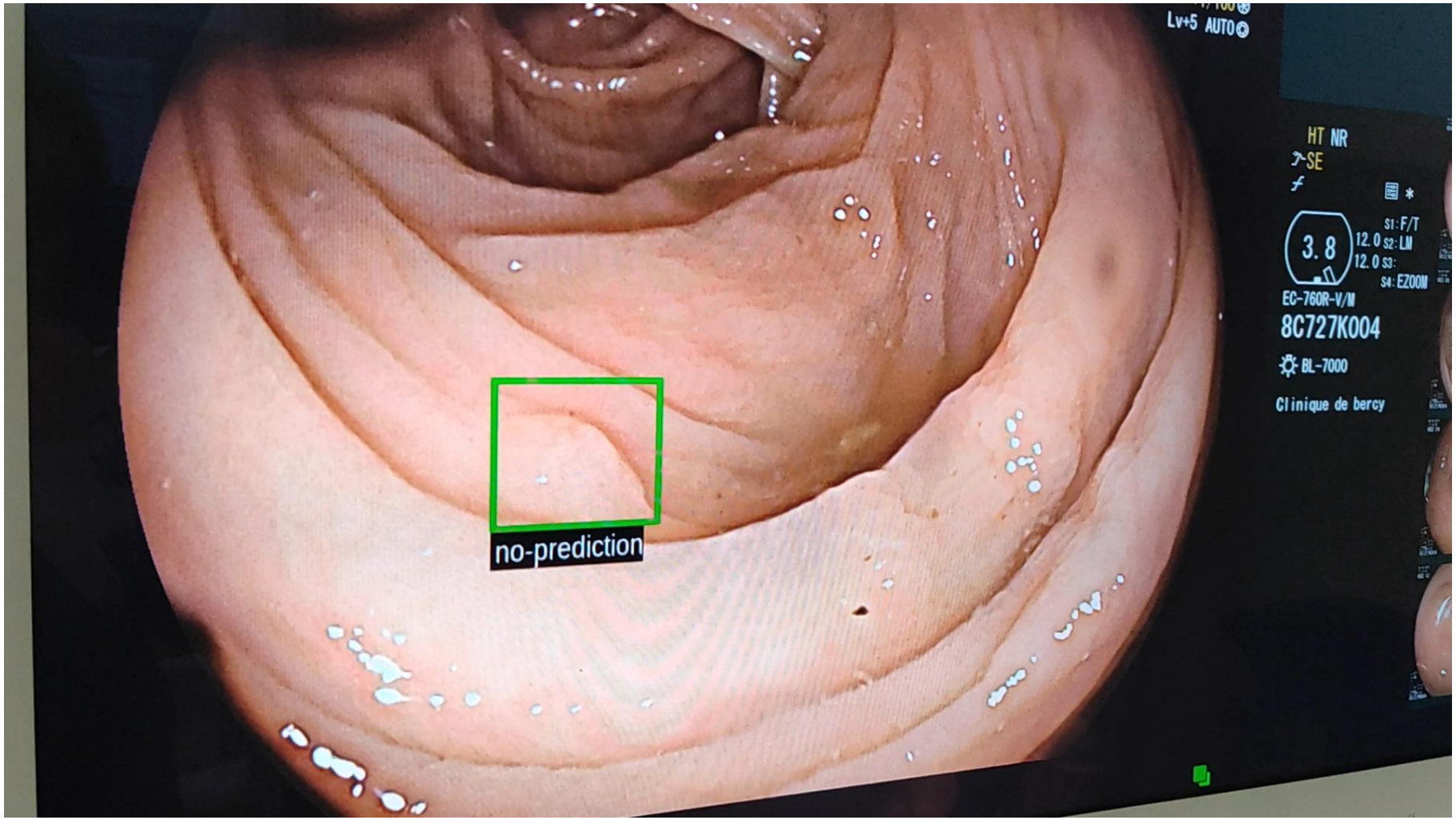
Et demain ?


Lv+5 AUTO
HT NR
SE
3.8
12.0
12.0
S1: F/T
S2: LM
S3:
S4: EZOOM
EC-760R-V/M
8C727K004
BL-7000
Clinique de bercy
no-prediction