Computer aided characterization of polyps with invasive colorectal cancers

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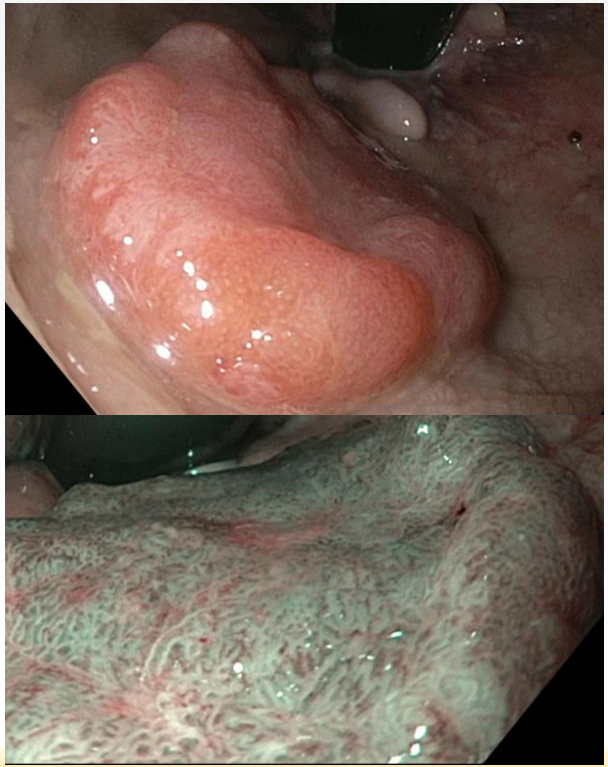
Optical diagnosis of submucosal invasive carcinomas

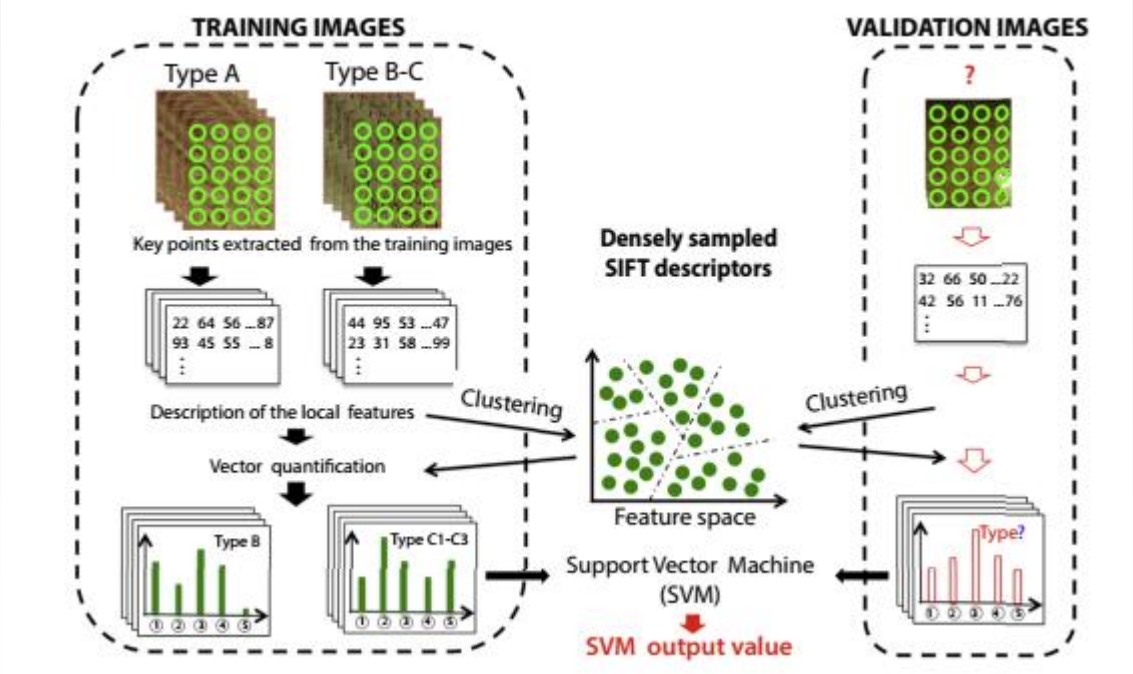


- Identify the cases with submucosal invasive carcinomas
- Identify the cases eligble for minimal invasive treatment
- Which technique to use (eFTR, ESD, TAMIS, LIMERIC)

Endoscopist do not perform well in “real life”

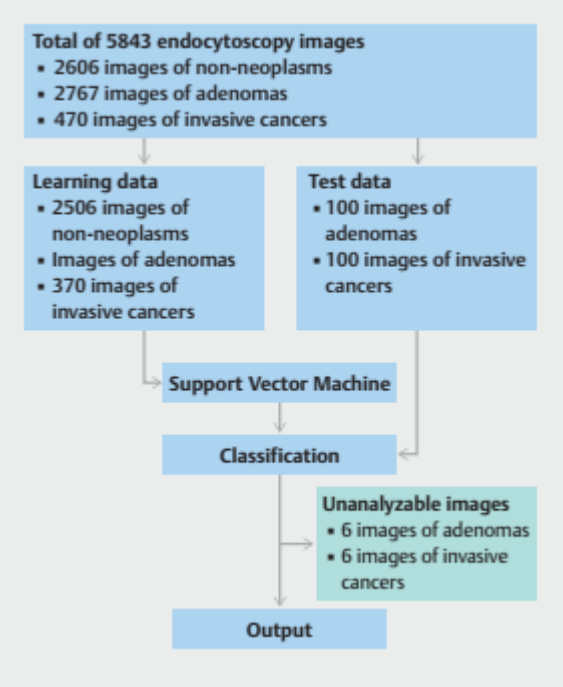
- 60-80% of T1 CRCs are diagnosed at histology
- 13-16% covert T1 in benign rectal polyps
- Incorrect diagnosis result in unnecessary surgery

Computer Aided Diagnosis (CAD)



Kominami GIE 2016

CAD endocytoscopy predicts the presence of cancer



▶ **Table 2** Diagnostic ability of endocytoscopy computer-aided diagnosis for invasive cancer.

Diagnosis of EC-CAD	Pathological diagnosis, n	
	Invasive cancer	Adenoma
Invasive cancer	84	1
Adenoma	10	91

EC-CAD, endocytoscopy computer-aided diagnosis.

Takeda, Endoscopy 2017

High accuracy with CAD endocytoscopy

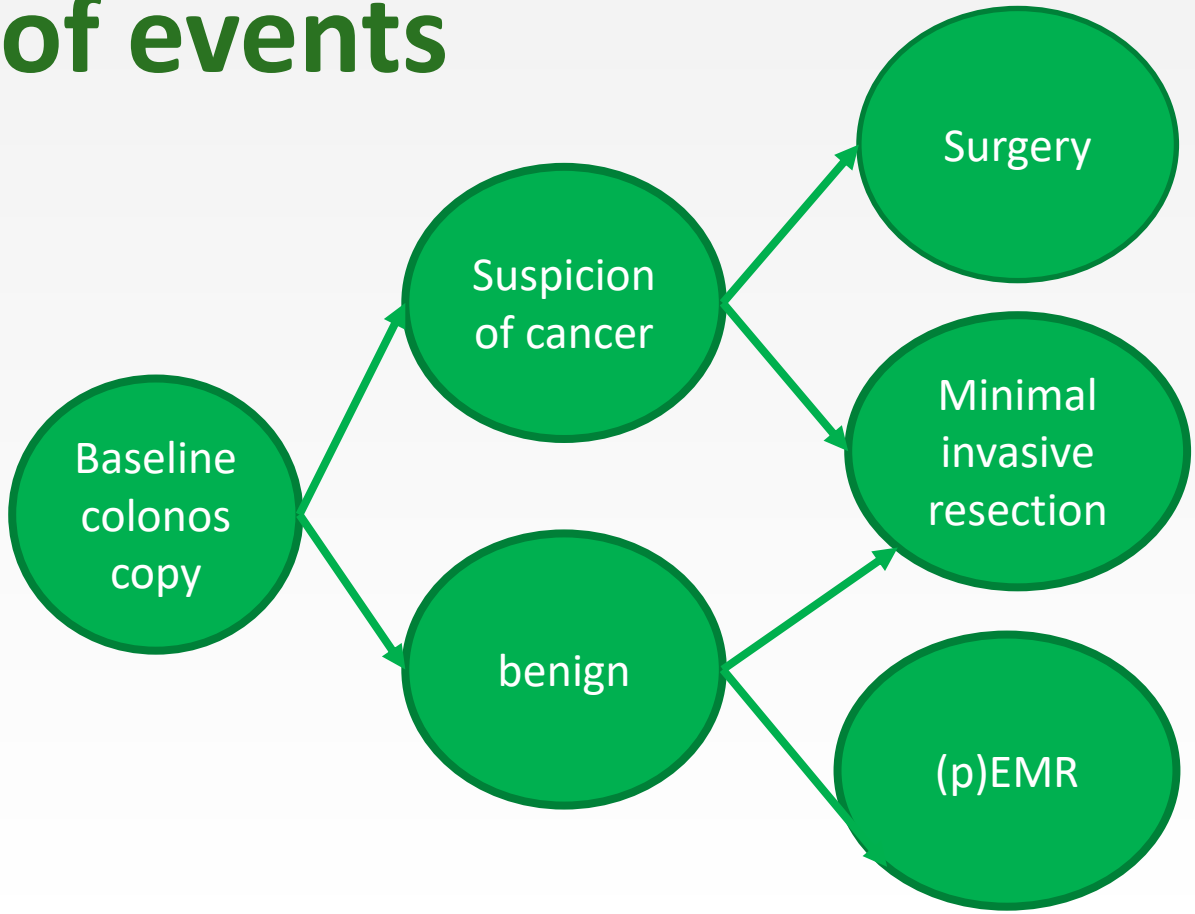
▶ **Table 3** Ability of endocytoscopy computer-aided diagnosis to distinguish invasive cancer from adenoma.

	Diagnostic yield, % (95 %CI)				
	Sensitivity	**Specificity**	**Accuracy**	**PPV**	**NPV**
Overall	89.4 (81.3 – 94.8)	98.9 (94.1 – 100)	94.1 (89.7 – 97.0)	98.8 (93.6 – 100)	90.1 (82.5 – 95.1)
High confidence*	98.1 (90.1 – 100)	100 (95.5 – 100)	99.3 (95.9 – 100)	100 (93.3 – 100)	98.8 (93.3 – 100)

EC-CAD, endocytoscopy computer-aided diagnosis; NPV, negative predictive value; PPV, positive predictive value; CI, confidence interval.
* ≥ 90 % probability of being correct.

Takeda, Endoscopy 2017

Chain of events



Estimating the risk of an invasive carcinoma

			Proximal location				Distal location			
			Homogeneous granular	Granular with large nodule	Granular with non-granular erythematous area	Non-granular	Homogeneous granular	Granular with large nodule	Granular with non-granular erythematous area	Non-granular
Hiroshima A-B	Bleeding-	Depressed area -	1,9	2,5	2,6	2,8	2,8	3,8	3,9	4,2
		Depressed area +	1,8	2,5	2,6	2,8	2,8	3,7	3,8	4,1
	Bleeding+	Depressed area -	4,5	6,0	6,1	6,6	6,6	8,8	9,0	9,7
		Depressed area +	4,4	5,9	6,1	6,5	6,5	8,7	8,8	9,5
Hiroshima C1	Bleeding-	Depressed area -	9,7	12,8	13,0	14,0	13,9	18,1	18,4	19,6
		Depressed area +	9,5	12,6	12,8	13,8	13,7	17,8	18,2	19,4
	Bleeding+	Depressed area -	20,8	26,4	26,9	28,5	28,4	35,1	35,6	37,5
		Depressed area +	20,5	26,1	26,5	28,1	28,0	34,7	35,2	37,1
Hiroshima C2	Bleeding-	Depressed area -	34,1	41,4	42,0	43,9	43,8	51,6	52,2	54,1
		Depressed area+	33,7	41,0	41,6	43,5	43,4	51,2	51,7	53,7
	Bleeding+	Depressed area -	55,9	63,4	64,0	65,8	65,7	72,3	72,8	74,3
		Depressed area +	55,5	63,0	63,6	65,4	65,3	72,0	72,4	74,0
Hiroshima C3	Bleeding-	Depressed area -	64,3	71,1	71,6	73,2	73,1	78,8	79,2	80,5
		Depressed area +	63,9	70,8	71,3	72,9	72,8	78,5	78,9	80,2
	Bleeding+	Depressed area -	81,6	85,8	86,1	87,0	87,0	90,1	90,3	91,0
		Depressed area +	81,3	85,6	85,9	86,8	86,8	90,0	90,2	90,8

Backes et al. Gut 2018

How to proceed

- It has to be “on the job”
- Embedded in an assesment approach
- A very large number of good pictures of polyps with known reliable histological outcome are needed to make a robust algorithm
- Multiple endpoints answering different questions:
  - Cancer or not
  - T2 or deeper
  - High risk T1

Conclusions

- Computer aided characterization of polyps is necessary to improve care

- Due to the large numbers, collaboration is needed

Name of presenter