Follow-up with computed tomography after spontaneous isolated dissection of the splanchnic artery

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Purpose

- No specialized study to date has evaluated radiological changes during the natural course of spontaneous isolated splanchnic arterial dissection

- No consensus regarding the optimal follow-up protocol.

- Aim of this study → to evaluate radiological changes on follow-up CT in patients with SIDSMA or SIDCA.

Materials and Methods

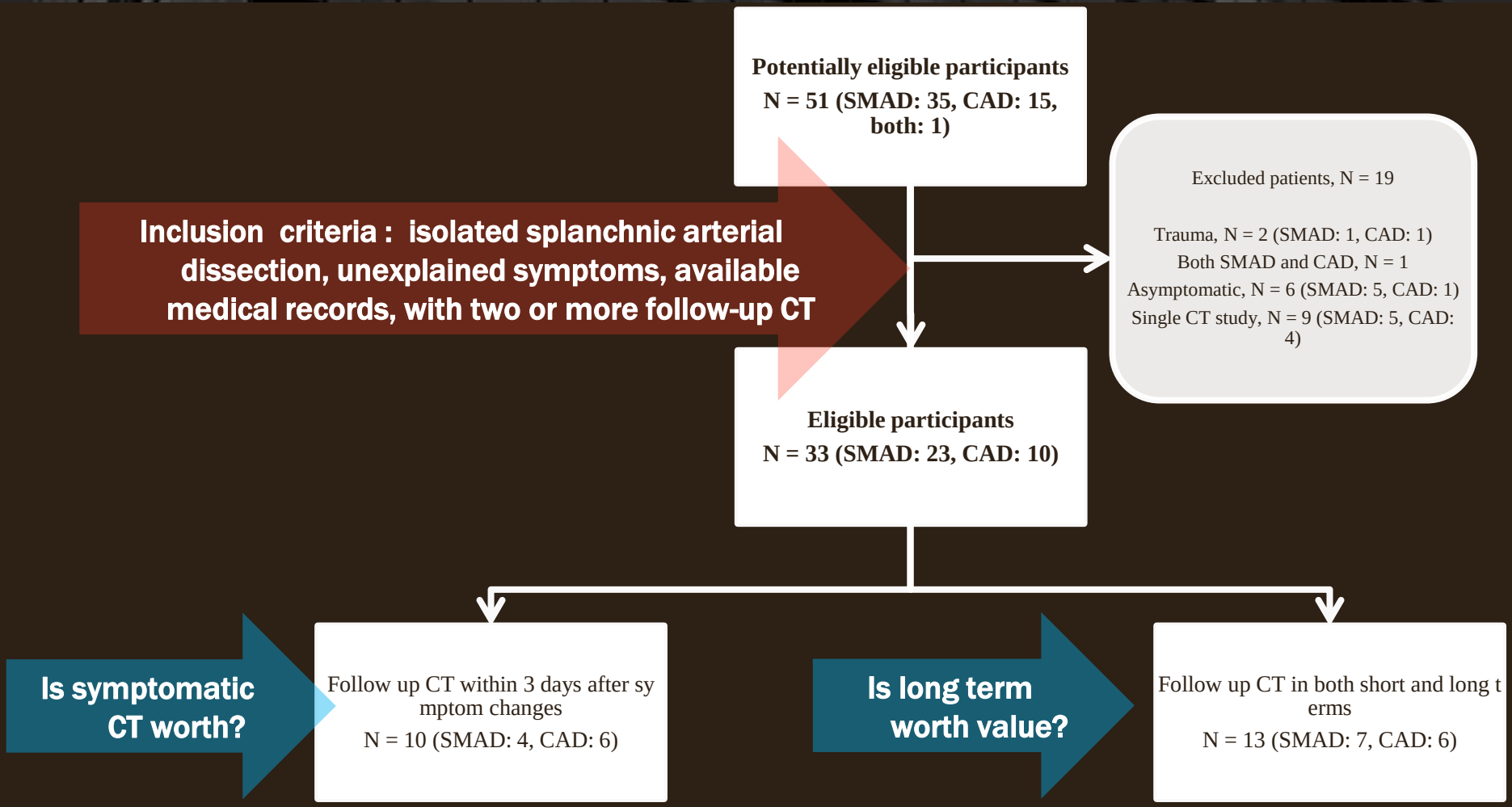
ethics, patient demographic

- Retrospective review of medical records and approved by the hospital institutional review board.

- Patient demographics
  - January 2001 and February 2016.
  - key diagnostic terms to search our institutional database: “artery dissection,” “SMA dissection,” “celiac dissection,” “SMA thrombus,” and “celiac thrombus.”

Materials and Methods

ethics, patient demographic



Materials and Methods

ethics, patient demographic

	SIDSMA (23 patient)	SIDCA (10 patient)
Age, years	53.5	43.7
Male, n	21 (91.3%)	9 (90%)
Female, n	2 (8.7%)	1 (10%)
Smoker, n	12 (52.2%)	7 (70%)
Hypertension, n	8 (34.8%)	4 (40%)
Diabetes mellitus, n	1 (4.3%)	2 (20%)
Others	cerebrovascular Accident, 1 (4.3%)	0
Abdominal pain location, n	epigastric17 (65%) diffuse, 4 (17.4%); other, 2 (8.7%)	epigastric, 5 (50%); other, 5 (50%)
Other symptoms, n	melena, 1 (4.3%)	0
Symptom regression, n	23	10

- ✓ underlying disease such as hypertension or diabetes mellitus
- ✓ Risk factors, such as smoking or pregnancy, for spontaneous arterial dissection.

Materials and Methods

Initial CT imaging analysis

- **Diagnosis, based on CT findings**, intimal flap or thrombosis of false lumen of SMA or CA
- **8 radiological features of dissection**

1. Distance from splanchnic artery orifice to dissection entry
2. Length of dissection
3. Presence of a thrombus in false lumen
4. Maximal outer diameter of dissected arterial segment
5. Degree of luminal stenosis , following equation: percent stenosis = (1 − [maximal stenotic diameter]/[unaffected SMA or CA orifice diameter])
6. Distal branch extension
7. Absence of distal flow
8. End-organ injury included bowel ischemia and infarction

Materials and Methods

Follow-up CT imaging analysis

- Follow-up CT at the clinician's discretion
- 7 of the radiological features change excluding distance from splanchnic artery orifice to dissection entry.

1. **Natural course : initial and final CT scans :** progression (true lumen compromise/ false lumen increased over 10%), no significant change (decreased degree ≤20%) , partial improvement (decreased degree between 20% and 80%), and near regression (decreased degree > 80%).
2. **Utility of long-term follow up CT** : initial images and short-term CT (within 1 week) follow-up or long-term CT follow-up (between 1week and 6 month) : SIDSMA 7 SIDCA 6
3. **Relationship between morphological findings and symptoms** : follow-up CT within 3 days after symptomatic changes

Materials and Methods

Statistical analysis

- Continuous data median value : Wilcoxon signed-rank tests
- Categorical data positive (+) or negative (−) : Fisher exact probability test
- SPSS statistical software (ver. 22.0; IBM, Armonk, NY)
- P value of < 0.05 : statistically significant difference.

Results

Initial CT findings and radiological changes of final follow-up CT

SIDSMA	Initial CT findings	N*	No change, n (%)	Partial improvement, n (%)	Regression, n (%)	Progression, n (%)
Entry distance, mm	12.87					
Dissection length, cm	8.43	23	12 (52.2%)	6 (26.1%)	4 (17.4%)	1 (4.3%)
Thrombus presence	19 (82.60%)	19	10 (52.6%)	5 (26.3%)	4 (21.1%)	0
Dissection diameter, mm	10.3	23	12 (52.2%)	2 (8.7%)	4 (17.4%)	5 (21.7%)
Stenosis degree, %	57.52	23	10 (43.5%)	6 (26.1%)	4 (17.4%)	3 (13.0%)
Distal branch extension	8 (39.10%)	8	4 (50%)	3 (37.5%)	1 (12.5%)	0
Absence of distal flow	0	0	0	0	0	0
End-organ injury	1 (4%)	1	0	0	1 (100%)	0
SIDCA	**Initial CT findings**	**N***	**No change, n (%)**	**Partial improvement, n (%)**	**Regression, n (%)**	**Progression, n (%)**
Entry distance, mm	4.4					
Dissection length, cm	2.14	10	4 (40%)	3 (30%)	1 (10%)	2 (20%)
Thrombus presence	70%	7	4 (57.1%)	1 (14.3%)	1 (14.3%)	1 (14.3%)
Dissection diameter, mm	9.8	10	6 (60%)	0	1 (10%)	3 (30%)
Stenosis degree, %	49.7	10	0	6 (60%)	1 (10%)	3 (30%)
Distal branch extension	SA, 6 (60%) CHA, 2 (20%) LGA, 1 (10 %) GDA, 1 (10%)	7	5 (71.4%)	2 (28.6%)	0	0
Absence of distal flow	1 (10%)	1	0	0	1 (100%)	0
End-organ injury	3 (30%)	4	2 (50%)	2 (50%)	0	0

- ✓ discrepancy of follow up imaging due to different physician
- ✓ initial CT and first follow-up
  - SIDSMA mean 12.9 days (range, 4 h–48 days) and mean 3 (range, 2–5)
  - SIDCA mean 5.8 days (range, 1–31 days) and mean 4 (range, 2–8)

Results

Radiological changes in the short-term and long-term follow-up groups

SIDSMA (7 patients)	Short-term change	Long-term change	P-value
Dissection length (cm)	8.6 ± 7.2	22.2 ± 21.9	0.128
Dissection diameter (mm)	−14.2 ± 8.4	−6.7± 18.5	0.197
Stenosis degree (%)	−3.1 ± 39.6	25.4 ± 12.7	0.043
SIDCA (6 patients)	**Short-term change**	**Long-term change**	**P-value**
Dissection length (cm)	−10.0 ± 8.4	7.4 ± 47.0	0.344
Dissection diameter (mm)	−8.9 ± 7.7	−5.7 ± 11.0	0.581
Stenosis degree (%)	2.9 ± 27.2	0.8 ± 48.5	0.715

Table 3. Continuous data analysis: short-term and long-term follow-up comparison

Categorical variables

- No significant difference between short-term and long-term follow up groups

incidence comparence of radiological progression (> 1 feature on CT) between short and long-term follow-up groups

- ✓ short-term follow-up group 23
  14 (SIDSMA: 8, SIDCA: 6) luminal stenosis > dissection diameter > dissection length
  → only 1 patient showed symptom progression
- ✓ long-term follow-up group 21 (SIDSMA 14 SIDCA 7)
  3 (SIDSMA: 2, SIDCA: 1)
  → None showed symptomatic or clinical disease progression

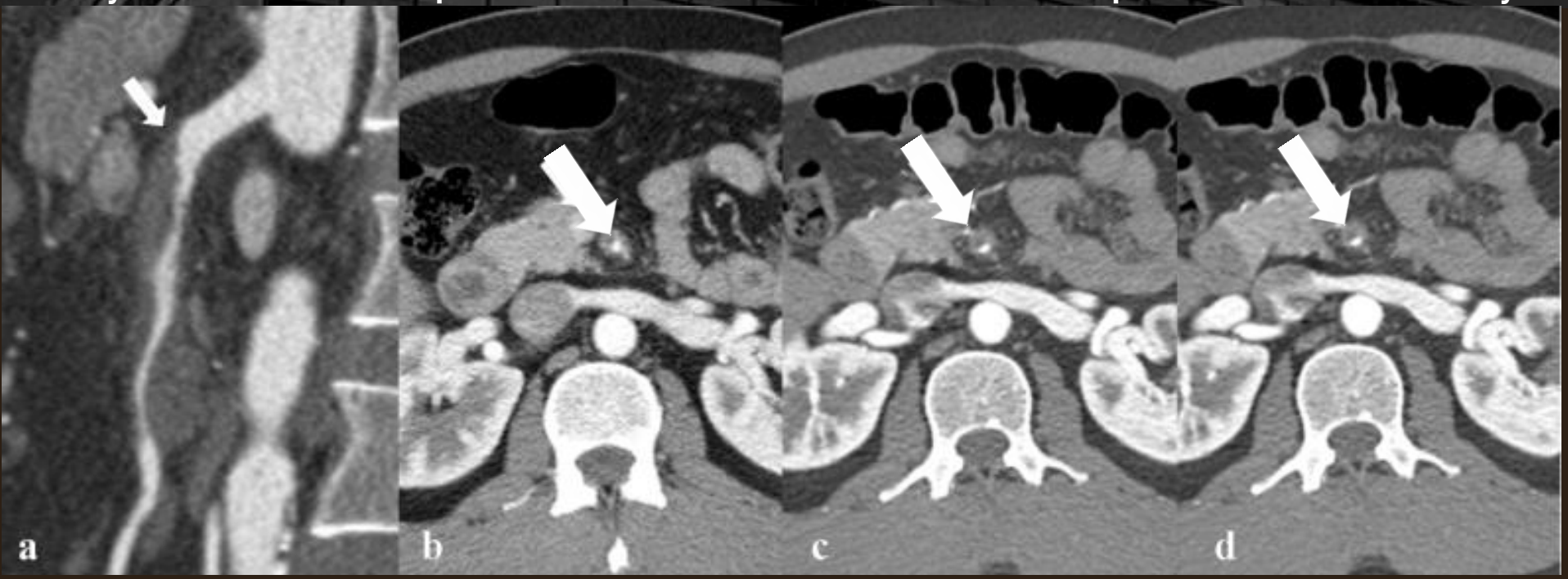
Results

Radiological changes on follow-up CT after changes in symptoms

	Symptom	Time to CT, days	Changes in CT findings													
SIDSMA, N*			Dissection length, cm		Thrombus presence		Dissection diameter, mm		Stenosis degree, %		Distal branch extension		Absence of distal flow		End-organ injury	
7	Resolved	6	8.8	8.1	+	+	10	12	60	25	–	–	–	–	–	–
8	Progressed	2	13.3	13.1	+	+	11	11	37	64	–	–	–	–	–	+
15	Resolved	3	4.8	4.8	+	+	12	11	58	55	–	–	–	–	–	–
20	Resolved	2	7.7	8.0	+	+	9	9	45	45	+	+	–	–	–	–
SIDCA, N*			Dissection length, cm		Thrombus presence		Dissection diameter, mm		Stenosis degree, %		Distal branch extension		Absence of distal flow		End-organ injury	
2	Resolved	3	2.5	2.7	+	+	9	10	33	40	+	+	–	–	–	–
4	Resolved	3	1.9	2.3	–	–	9	10	56	60	+	+	–	–	+	+
5	Resolved	4	2.6	2.8	+	+	10	12	70	58	+	+	–	–	–	–
7	Resolved	3	2.3	2.3	+	+	10	10	40	50	-	+	–	–	–	–
8	Progressed	5	2.1	1.9	+	+	10	10	100	40	+	+	+	–	+	+
10	Resolved	2	1.9	2.5	–	+	10	11	38	18	+	+	–	–	–	–

Results

A 50-year-old man with spontaneous isolated dissection of the superior mesenteric artery



initial	initial	1 day	51 day
	luminal stenosis 78%	luminal stenosis 73%	luminal stenosis 55%

→ Radiologically gradual improvement, no symptom relapse.

A 38-year-old man with spontaneous isolated dissection of the celiac artery

initial

luminal
stenosis 70%

4 day

luminal
stenosis 58%

30 day

luminal
stenosis 46%

→ Radiologically gradual improvement, no symptom relapse.

A 46-year-old man with spontaneous isolated dissection of the superior mesenteric artery

→ 2nd day follow up CT with symptom progression, progressed radiological finding.

Discussion

1. Differences between short-term and long-term CT follow up
   - Only statistically different luminal stenosis at dissected segment in SIDSMA
   - But, luminal stenosis also questionable of discrepancy with clinical symptom in our case
2. 10 identified cases of follow-up CT performed after symptomatic changes, only 2 patients showed symptomatic progression, only one patient showed matching radiological progression on CT
   - progression of CT findings may not be as clinically important as previously thought !
3. Most radiological progression within the first week after dissection in the acute phase
   - 14 of 23 patients within 1week
   - 2 of 21 patients between 1 week and 6 months → none with symptoms
   - most significant progression occurs in the acute phase

Discussion

4. **Additionally, no clinical difference** in outcome between complete regression group and the other groups, **No** long term splanchnic artery dissection-related **mortality or post-discharge recurrence**

➢ Do we really need routine long-term follow-up in patients ? → **No!!**

- Limitations
  - retrospective design and limited clinical data
  - number of cases still small for a sufficient statistical analysis of the correlation between radiological findings and clinical course

Conclusion

- **Questionable utility of routine CT follow-up** in patients with **spontaneous isolated arterial dissection**, especially considering the **cost** of serial CT scanning and the **high cumulative radiation dose**

- Need to avoid **unnecessary routine CT follow up** in the absence of symptom progression

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