



Cerebral Aneurysms in Pregnancy: Pregnancy and Delivery Do Not Increase the Risk of Aneurysm Rupture

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Introduction

It is not known what effect pregnancy or delivery has on the risk of rupture of a cerebral aneurysm, and consequently, the optimal management of unruptured aneurysms in pregnancy is unclear. We analyzed the Nationwide Inpatient Sample Database to study the effect of pregnancy and delivery on the risk of rupture of cerebral aneurysms.

Methods

Hospital discharge data were obtained from the Nationwide Inpatient Sample (NIS) Database for years 1998-2009. Pregnancy- or delivery-related hospitalizations with intracranial aneurysm were identified by ICD-9 code and analyzed for the incidence of aneurysm rupture. We considered pregnancy- and delivery-related hospitalizations separately. To estimate the risk of rupture during pregnancy and delivery, we took the ratio of the number of ruptured aneurysms to the number of women in the dataset who likely had unruptured aneurysms that were not detected during their hospitalizations. We used the reported prevalence of unruptured aneurysm in the general population (Vlak MH et al. Lancet Neurol. 2011) to estimate the number of women in the dataset with unruptured aneurysms.

Results

There were 2,715,161 hospitalizations involving pregnancies in the NIS database between 1988 and 2009; 193 involved unruptured aneurysms and 714 involved ruptured aneurysms. Assuming 1.8% prevalence of unruptured aneurysms among all women of pregnancy age, we estimated 48,873 women hospitalized for pregnancy and 312,128 women hospitalized for delivery had unruptured aneurysms. The risk of rupture during pregnancy and deliveries were 1.4% (714/48,873; 95% CI=[1.35,1.57]) and 0.05% (172/312,128; 95% CI=[0.0468, 0.0634]), respectively. Among patients in the NIS database with diagnosed unruptured aneurysms during those years, 153 cesarean deliveries in 218 deliveries with unruptured aneurysms were performed, resulting in an estimated national rate of 70.18% (95% CI, 64.06-76.30%). Cesarean deliveries were significantly higher in patients with unruptured aneurysms (p<.0001).

Conclusions

Given the results of this study, it seems unlikely that pregnancy and delivery greatly alter the natural history of a previously asymptomatic cerebral aneurysm. In addition, the significantly higher rate of cesarean deliveries performed in pregnant patients with unruptured aneurysms may not be necessary.

References

1. Vlak MH, Algra A, Brandenburg R, Rinkel GJ. Prevalence of unruptured intracranial aneurysms, with emphasis on sex, age, comorbidity, country, and time period: A systematic review and meta-analysis. Lancet neurology. 2011;10:626-636
2. Treadwell SD, Thanvi B, Robinson TG. Stroke in pregnancy and the puerperium. Postgraduate medical journal. 2008;84:238-245
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Learning Objectives

- By the conclusion of this session, participants should be able to:
- 1) Discuss what effect pregnancy or delivery has on the risk of rupture of a cerebral aneurysm.
- 2) Identify effective treatments of unruptured aneurysms in pregnancy.

Patient and hospital demographics for ruptured aneurysm with pregnancy

	Type of Treatment			Neither coil nor clip (n=618)
	Overall (n=714)	Coiling performed (n=21)	Clipping performed (n=79)	
Age, years (mean ± SD)	30.3±8.0	20.1±9.2	30.6±6.0	30.3±8.2
Median income in patient's ZIP code				
Low	158 (23.1%)	5 (23.8%)	22 (31.4%)	131 (22.1%)
Low to Middle	178 (26.1%)	4 (19.1%)	12 (17.1%)	162 (27.4%)
Middle to High	153 (22.4%)	9 (42.9%)	14 (20.0%)	130 (22.0%)
High	194 (28.4%)	3 (14.3%)	22 (31.4%)	169 (28.6%)
Primary payer				
Medicaid	15 (2.1%)	0 (0%)	0 (0%)	15 (2.4%)
Medicare	270 (38.0%)	6 (28.6%)	35 (46.7%)	229 (37.2%)
Private insurance	368 (51.8%)	13 (61.9%)	33 (44.0%)	322 (52.4%)
Self-pay	29 (4.1%)	1 (4.8%)	3 (4.0%)	25 (4.1%)
No charge	2 (0.3%)	1 (4.8%)	1 (1.3%)	0 (0%)
Other	27 (3.8%)	0 (0%)	0 (0%)	24 (3.9%)
Hospital bed size				
Small	38 (5.3%)	1 (4.8%)	2 (2.7%)	35 (5.7%)
Medium	153 (21.5%)	1 (4.8%)	12 (16.0%)	140 (22.7%)
Large	522 (73.2%)	19 (90.5%)	61 (81.3%)	442 (71.6%)
Hospital location/teaching status				
Rural	21 (3.0%)	0 (0%)	1 (1.3%)	20 (3.2%)
Urban non-teaching	215 (30.2%)	2 (9.5%)	22 (29.3%)	191 (31.0%)
Urban teaching	477 (66.9%)	19 (90.5%)	52 (69.3%)	406 (65.8%)
Hospital region				
Northeast	111 (15.6%)	2 (9.5%)	12 (16.0%)	97 (15.7%)
Midwest	167 (23.4%)	4 (19.1%)	20 (26.7%)	143 (23.1%)
South	265 (37.1%)	8 (38.1%)	24 (32.0%)	233 (37.7%)
West	171 (24.0%)	7 (33.3%)	19 (25.3%)	145 (23.5%)
Annual hospital case volume (mean±SD)	43.6±47.6 (n=574 hospitals*)	97.2 ±71.3 (n=15 hospitals*)	49.5±51.4 (n=58 hospitals*)	41.2±45.3 (n=500 hospitals*)
In-hospital mortality	68 (9.5%)	0 (0%)	5 (6.7%)	63 (10.2%)
Discharge disposition				
Home or short-term facility	497 (69.4%)	15 (70.5%)	52 (68.7%)	430 (69.0%)
Long-term facility	26 (4.5%)	1 (4.8%)	4 (6.7%)	21 (3.4%)
Dead	59 (10.1%)	0 (0%)	4 (6.7%)	55 (10.9%)
Inflation-adjusted hospital charges (mean±SD dollars)	\$70,510±\$100,373	\$195,293±\$138,238	\$152,190±\$180,801	\$55,848±\$73,473
Length of stay (mean±SD days)	8.9±9.3	18.9±12.3	15.8±8.8	7.7±8.7

Patient and hospital demographics for ruptured aneurysm with delivery

	Type of Treatment			Neither coil nor clip (n=142)
	Overall (n=172)	Coiling performed (n=8)	Clipping performed (n=22)	
Age, years (mean ± SD)	30.5±8.5	27.4±6.0	32.4±4.6	30.4±9.0
Median income in patient's ZIP code				
Low	47 (28.4%)	2 (25.0%)	5 (22.7%)	40 (29.6%)
Low to Middle	39 (23.0%)	3 (37.5%)	9 (40.9%)	27 (20.0%)
Middle to High	33 (20.0%)	1 (12.5%)	1 (4.6%)	31 (23.0%)
High	46 (27.0%)	2 (25.0%)	7 (31.8%)	37 (27.4%)
Primary payer				
Medicaid	6 (3.5%)	0 (0%)	0 (0%)	6 (4.3%)
Medicare	67 (39.2%)	4 (50.0%)	9 (40.9%)	54 (38.3%)
Private insurance	84 (49.1%)	4 (50.0%)	11 (50.0%)	69 (49.9%)
Self-pay	11 (6.4%)	0 (0%)	2 (9.1%)	9 (6.4%)
No charge	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Other	3 (1.8%)	0 (0%)	0 (0%)	3 (2.1%)
Hospital bed size				
Small	9 (5.2%)	0 (0%)	0 (0%)	9 (6.3%)
Medium	49 (28.5%)	2 (25.0%)	4 (18.2%)	41 (30.3%)
Large	114 (66.3%)	6 (75.0%)	18 (81.3%)	90 (63.4%)
Hospital location/teaching status				
Rural	10 (5.8%)	0 (0%)	0 (0%)	10 (7.0%)
Urban non-teaching	53 (30.8%)	0 (0%)	5 (22.7%)	48 (33.8%)
Urban teaching	109 (63.4%)	8 (100%)	17 (77.3%)	84 (59.2%)
Hospital region				
Northeast	25 (14.5%)	1 (12.5%)	3 (13.6%)	21 (14.8%)
Midwest	38 (22.1%)	4 (50.0%)	6 (27.3%)	28 (19.7%)
South	54 (31.4%)	1 (12.5%)	7 (31.8%)	46 (32.4%)
West	55 (32.0%)	2 (25.0%)	6 (27.3%)	47 (33.1%)
Annual hospital case volume (mean±SD)	38.6±37.7 (n=168 hospitals*)	51.8 ±37.2 (n=8 hospitals*)	55.0±33.4 (n=21 hospitals*)	35.3±37.8 (n=139 hospitals*)
In-hospital mortality	31 (18.0%)	1 (12.5%)	1 (4.6%)	29 (20.4%)
Discharge disposition				
Home or short-term facility	100 (76.3%)	5 (63.3%)	14 (67.5%)	81 (74.3%)
Long-term facility	8 (6.1%)	0 (0%)	1 (6.3%)	7 (6.4%)
Dead	23 (17.6%)	1 (16.7%)	1 (6.3%)	21 (19.3%)
Inflation-adjusted hospital charges (mean±SD dollars)	\$103,917±\$152,230	\$146,476±\$151,998	\$225,425±\$227,364	\$81,758±\$126,792
Length of stay (mean±SD days)	13.6±20.8	10.2±3.5	28.6±32.0	11.5±18.2