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Original Article

Correlation Between Referral Type (Emergency VS Scheduled) and Maternal Perinatal Outcome in Suspected Placenta Accreta Spectrum : A Retrospective Cohort Study in Dr. Kariadi Hospital Semarang 2020–2023

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Abstract

Background : Maternal Mortality Rate (MMR) in Indonesia at 2023 was 189 over 100.000 live births. The most popular reason for maternal death was obstetrics hemorrhage. Obstetric hemorrhage can be caused by abnormal placentation. Abdominal delivery by cesarean section has increased recently in Indonesia. Cesarean section will increase the risk for placenta accreta spectrum, which raises maternal morbidity and mortality.
Aim : To analyze the correlation of emergency and scheduled referral with maternal and perinatal outcomes of suspected placenta accreta spectrum patients in Dr.Kariadi Hospital Semarang 2020 – 2023.
Methods : A cohort retrospective study performed in May 2024, involved 153 women with suspected placenta accreta spectrum were referred to Dr. Kariadi Hospital Semarang in 2020 – 2023, divided by emergency referral and scheduled referral groups. We use Placenta Accreta Index (PAI) Score and all patients who fulfilled the criteria of the placenta accreta spectrum based on FIGO to predict suspicious placenta accreta spectrum. Descriptive analysis included the base characteristics of the patients. Correlation analysis with maternal and perinatal outcomes using Chi Square analyze of SPSS 25.00 version.
Results : A total of 69 patients with emergency referrals and 84 patients with scheduled referrals. Mean age was 32.97, median 32(24–44), median of gestation was 3(1–6) and 3(1–9), median of gestational age was 35(22–41) and 36(32–39). The emergency referral had a higher risk for cesarean hysterectomy with OR (95%CI) 2.92 (1.51–5.67), for maternal hemorrhage with OR (95%CI) 2.34 (1.22–4.49), for blood transfusion with OR (95%CI) 6.02 (2.46–14.76), for intensive care admission with OR (95%CI) 4.39 (1.5–12.79), for prematurity with OR (95%CI) 2.56(1.32–4.92), for asphyxia with OR (95%CI) 3.41(1.56–7.47). There were significant differences between emergency and scheduled referrals for vaginal delivery (p=0.03), and perinatal mortality (p=0.04). Estimated blood loss was 1453.7 ± 1253.6 ml in emergency referral and 878.3 ± 823.7 ml in scheduled referral.
Conclusion : Emergency referrals had worse maternal and perinatal outcomes than scheduled referrals for suspicious placenta accreta spectrum patients.

Keywords : Emergency,placenta accreta, scheduled referral

INTRODUCTION

Maternal Mortality Rate (MMR) in Indonesia in 2023 was 189 over 100.000 live births.[1] It was higher than SDG's (Sustainable Development Goals) target in 2030, to decrease maternal mortality rate of 70 over 10.000 live births.[2] Most of maternal mortality at 2021 based on reason divided by related to COVID-19 as many as 2.982 cases, maternal hemorrhage 1.330 cases and hypertension in pregnancy 1.077 cases.[2] Maternal hemorrhage could be caused by the atonic uterus, abnormal placentation, obstetrics laceration, coagulopathy, other obstetrics factors such as obesity, postpartum hemorrhage history, pre-eclampsia, maternal immune, etc.[3]

The cesarean sections rates in Indonesia has increased recently. Indonesian Health Ministry Demographic Survey in 2018 gave data on the number of cesarean sections in Indonesia was 17.6% of all deliveries.[4] History of cesarean section will increase the risk of placenta accreta, the presentation for placenta accreta spectrum will increase by 0.3% from the history of one time cesarean section, and increase by 6.74% from the history of five times or more cesarean sections.[5] Placenta accreta is one of the abnormal placentation types, resulting in higher morbidity and mortality rates than other maternal hemorrhages.[6]

Placenta accreta is defined as abnormal trophoblast invasion of part or all of the placenta into the myometrium of the uterine wall. Placenta accreta spectrum, formerly known as morbidly adherent placenta, refers to the range of pathologic adherence of the placenta, including placenta accreta, placenta increta and placenta percreta. Maternal morbidity and mortality can occur because of severe hemorrhage, which often requires a blood transfusion.[7]

The efforts to improve obstetric management for the placenta accreta spectrum require good screening for diagnosing placenta accreta for preparing appropriate surgical treatment. This is important for establishing the right diagnosis when antenatal care for pregnant women with suspicion of placenta accreta spectrum. Proper diagnosis can guide in preparing scheduled referrals to tertiary hospitals as a center for placenta accreta, so patients do not suffer from emergency conditions that can increase maternal and perinatal morbidity such as massive hemorrhage, massive blood transfusion, intensive care unit admission, and even maternal death, or fetal emergency that cause asphyxia, prematurity or perinatal death.[8]

The incidences of the placenta accreta spectrum are increasing. The case report of placenta accreta spectrum in Indonesia, from Medicine Faculty of Airlangga University – Dr.Sutomo Hospital, Surabaya, there were 7 cases in 2015, 24 cases in 2016, 60 cases in 2017, 75 cases in 2018, and 83 cases in 2019, which any improvement of the number of case every year, and there were 8 patients were dead. (2,8%).[9] The incidence of placenta accreta spectrum in Kariadi Hospital also increases year by year. There were 5 cases in 2019, 4 cases in 2020, 13 cases in 2021, and 18 cases in 2022. This increasing case gives to improvement of maternal hemorrhage and other complications.

Although the number of placenta accreta cases has increased, there was no studies research on the correlation between referral type and the outcomes of placenta accreta spectrum. We hope this study can become the reference of referral type for suspicious placenta accreta spectrum to give proper treatment to reduce maternal and perinatal morbidity and mortality.

Placenta accreta is defined as abnormal trophoblast invasion of part or all of the placenta into the myometrium of the uterine wall. Placenta accreta spectrum, formerly known as morbidly adherent placenta, refers to the range of pathologic adherence of the placenta, including placenta accreta, placenta increta and placenta percreta.[7]

The placenta was attached tightly to myometrium in placenta accreta, so it was difficult to release it spontaneously, or there was continuous hemorrhage from the placental implantation site.[10] The histopathology discovery, absence of desidua layer or Nitabuch layer or invasion of villi chorialis into the myometrium. This definition was updated by the International Federation of Obstetrics and Gynecology, by called it with Placenta Accreta Spectrum Disorders.[10,11]

Placenta accreta spectrum can occur as a result of wound in uterine tissue, which can trigger abnormal decidualization of the endometrium or damage the local scar and an abnormal adherent placenta in the next pregnancy.[12] Placenta Accreta Spectrum was not exclusively caused by cesarean section.[13] All procedures that caused the damage in the uterus, like curettage, manual placenta, hysterocopy, endometrial ablation, myomectomy and uterine artery embolization, were related to placenta accreta in the next pregnancy.[14]

Parameter of Placenta Accreta Index Score

Parameter	Value
Previous CS ≥ 2 kali	3.0
Lacuna	
Grade 3	3.
Grade 2	1.0
Myometrium thickness ≤ 1 mm	1.0
1–3 mm	0.5
3–5 mm	0.25
Anterior placenta previa	1,0
Bridging vessels	0.5

All pregnant women should be screened for the risk of placenta accreta spectrum from anamnesis and some examination.[15] We must know the age of the mother, number of parity, history of uterine surgery, history of placenta previa, antenatal hemorrhage, etc.[7] Ultrasound, Magnetic Resonance Imaging and biological marker. Ultrasound is the first choice for placenta accreta screening because more effective, cheaper, feasible and efficient.[16] We will evaluate lacuna, myometrial thickness, myometrial integrity, retroplacental clear zone, bridging vessel, subplacental vascularity, and gap of myometrial blood flow.[17]

Martha C Rac (2014) provides a mathematical formula to make a scoring system for predicting placenta accreta spectrum by several parameters in the Placenta Accreta Index Score.[18]

METHODS

A cohort retrospective study was performed on May 2024 in Dr. Kariadi Hospital Semarang. We used the secondary data of patients medical records with suspected placenta accreta spectrum were referred to Dr. Kariadi Hospital Semarang in 2020 – 2023. The inclusion criteria were pregnant women 2nd and 3rd trimesters with Placenta Accreta Index score > 0 and all patients who fulfilled the criteria of the placenta accreta spectrum based on FIGO. The exclusion criteria were patients diagnosed with suspicious placenta accreta in Dr. Kariadi Hospital and patients with incomplete medical records.

A total of 160 patients with suspicion of placenta accreta spectrum were evaluated, then 5 patients were diagnosed with placenta accreta spectrum by Antenatal Care in Dr. Kariadi Hospital, and 2 patients had no complete medical records, so we had 153 patients that fulfilled inclusion criteria. Then divided into emergency referral and scheduled referral groups. Descriptive analysis included the the base characteristics of the patients, such as age, gestation, gestational age, fund, history of antepartum hemorrhage, history of cesarean section, history of uterine surgery, history of dilatation and curettage, history of uterine radiation, history of endometritis, placenta previa, history of manual removal of placenta, history of placenta accreta, history of Intra Uterine Device, and history of placenta previa. Kolmogorov-Smirnov test was used to analyze numeric data, if the data has an abnormal distribution, analyzed and compared to Mann-Whitney test.

The independent variable was the type of referral (emergency and scheduled referral) and the dependent variables were maternal outcomes such as cesarean hysterectomy, conservative surgery, vaginal delivery, maternal haemorrhage, blood transfusion, intensive care unit admission and maternal death, and also perinatal outcomes such as prematurity, asphyxia and perinatal death. Correlation analysis between the independent variable and a dependent variable using Chi-Square analysis of SPSS 25.00 version. Estimated blood loss and amount of transfusion between referrals analyzed with Kolmogorov-Smirnov.

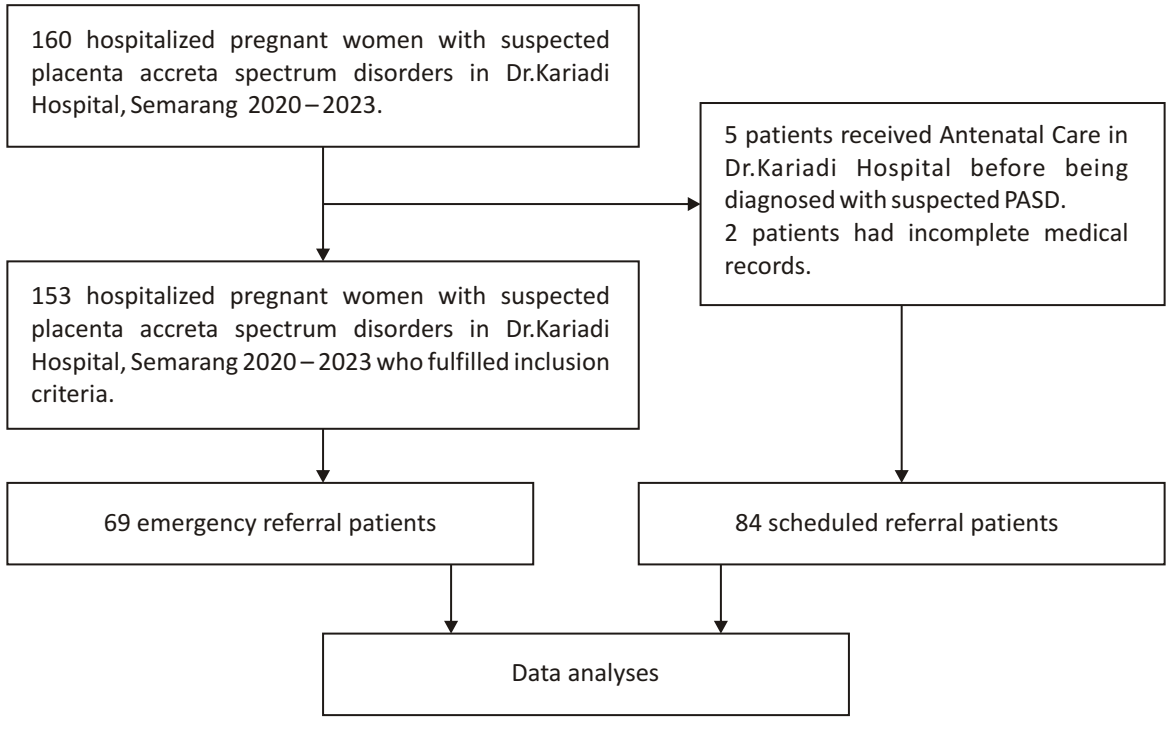

Figure 1. Flowchart of the study

RESULTS

We had 69 patients with emergency referral and 84 patients with scheduled referral. Based on the clinical characteristics of the subjects (Table 1), the mean age was 32.97, the median 32(24–44), a median of gestation was 3 (1–6) and 3 (1–9), and median gestational age was 35 (22–41) and 36 (32–39). There was significant differences between an emergency referral and scheduled referral for gestational age (p<0.01) and history of antepartum hemorrhage (p=0.02). The risk factor of the placenta accreta spectrum of the subject performed in Table 2.

From Table 3 about correlation emergency and scheduled referral with the maternal and perinatal outcome, the emergency referral had a higher risk for cesarean hysterectomy with OR (95%CI) 2,92 (1.51–5.67), for maternal hemorrhage with OR (95%CI) 2.34 (1.22–4.49), for blood transfusion with OR (95%CI) 6.02 (2.46–14.76), for intensive care admission with OR (95%CI) 4.39 (1.5–12.79), for prematurity with OR (95%CI) 2.56 (1.32–4.92), for asphyxia with OR (95%CI) 3.41 (1.56–7.47). There were significant differences between emergency and scheduled referral for vaginal delivery (p-value 0.03), and perinatal mortality (p-value 0.04).

Estimated blood loss was 1453.7 ± 1253.6 ml in emergency referral and 878.3 ± 823.7 ml in scheduled referral (Table 4). There was a significant difference in the transfusion of PRC between the two groups (p<0.01) (Table 5). Table 6 performed about histopathology results of the subjects, with overall 100 subjects (65.3%) appropriate with placenta accreta 31 (20.6%), placenta increta 54 (35,35) and placenta increta 15 (9.8%) and not examined (34.6%).

TABLE 1
Clinical characteristics of subjects

Variable	Emergency referral		Scheduled referral		*p*
	n = 69	Mean ±SD Median (min–max)	n = 84	Mean ±SD Median (min–max)	
Age (year)		3 (1–6)		32 (24–44)	0.96¥
20–35	48 (70%)		57 (68%)		
> 35	21 (30%)		27 (32%)		
Gestation		3 (1–6)		3 (1–9)	0.67‡
1	2 (3%)		1 (1%)		
2–3	45 (65%)		60 (71%)		
>3	22 (32%)		23 (27%)		
Gestational age (week)		35 (22–41)		36 (32–39)	<0.01‡*
< 28	3 (4%)		0 (0%)		
28–34	30 (44%)		18 (22%)		
>34	36 (52%)		66 (78%)		
Fund					.03¥*
JKN PBI	36 (52%)		28 (33%)		
JKN non PBI	30 (43%)		54 (64%)		
Other assurance	3 (4%)		2 (2%)		
Common	0 (0%)		0 (0%)		
Antepartum haemorrhage history					
Yes	22 (32%)		12 (14%)		
No	47 (68%)		72 (86%)		

Information : * Significant (p < 0,05); ¥ Continuity Correction; ‡ Mann-Whitney

TABLE 2
Risk of factor for placenta accreta spectrum of subjects

Risk factors for Accreta	Emergency referral (n=69)		Scheduled referral (n=84)	
	n	%	n	%
CS 1 time	23	33.3	43	51.2
CS ≥ 2 times	37	53.6	36	42.9
Placenta previa	38	55.1	31	36.9
History of curettage	22	31.9	22	26.2
History of uterine surgery	0	0	2	2.4
History of uterine radiation	0	0	0	0
History of IUD	14	20.3	12	14.3
History of removal placenta manually	0	0	0	0
History of placenta accreta	0	0	0	0
History of endometritis	0	0	0	0

TABLE 3
Correlation type of referral with maternal and perinatal outcome

Maternal and perinatal outcomes	Type of referral				*p*	OR (95%CI)
	Emergency		Scheduled			
	n	%	n	%		
Caesarean hysterectomy	41	59.4	28	33.3	0.01¥*	2.92 (1.51–5.67)
Conservative surgery	11	15.9	20	23.8	0.32¥	0.60 (0.27–1.37)
Vaginal delivery	7	10.1	0	0	0.03£*	–
Maternal haemorrhage	39	56.5	30	35.7	0.02¥*	2.34 (1.22–4.49)
Blood transfusion	62	89.9	50	59.5	<0.01¥*	6.02 (2.46–14.76)
ICU admission	15	21.7	5	6	0.01¥*	4.39 (1.51–12.79)
Maternal death	3	4.3	1	1.2	0.24£	3.77 (0.28–37.11)
Prematurity	43	62.3	33	39.3	0.01¥*	2.56 (1.32–4.92)
Asphyxia	25	36.2	12	14.3	0.03¥*	3.41 (1.56–7.47)
Perinatal death	4	5.8	0	0	0.04£*	–

Information : * Significant ($p < 0,05$); ¥ Continuity Correction; £ Fisher's Exact

DISCUSSION

The reproductive age appropriate for pregnancy, because of the minimal risk for pregnancy complications, was 20–35 years old.[19] The mean age of the subjects was 33.03 years old. The majority of gestation was 2–3, consistent with a risk factor for placenta accreta spectrum, that patients were multiparous.[7] Mean of gestational age was appropriate with timing for termination of the pregnancy with placenta accreta spectrum disorder from ACOG dan SMFM guideline (34^{+0} – 35^{+6} weeks), RCOG guideline (35^{+0} – 36^{+6} weeks), dan SOGC (34–36 weeks).[10] Patients' finances were important to prepared in every pregnancy, especially for the placenta accreta spectrum, because they need a multidisciplinary team, blood preparation, and intensive care unit admission. The

TABLE 4
Correlation type of referral with estimated blood loss

Type of referral	Estimated Blood Loss (ml)	
	Mean ± SD	Median
Emergency (n=69)	1.453.77 ± 1253.63	1000 (10 – 6000)
Scheduled (n=84)	878.31 ± 823.73	500 (200 – 4320)

TABLE 5
Correlation type of referral with type and number of transfusion

Transfusion	Type of referral	Number (kolf) Mean ± SD	*p*
PRC	Emergency	2.41 ± 1.79	<0.01*
	Scheduled	1.20 ± 1.19	
WB	Emergency	0.59 ± 1.09	0.12
	Scheduled	0.29 ± 0.59	
FFP	Emergency	0.38 ± 1.00	0.07
	Scheduled	0.11 ± 0.44	
TC	Emergency	0.07 ± 0.50	0.11
	Scheduled	0.00	

Information : *Significant ($p < 0.05$); Kolmogorov–Smirnov

TABLE 6
Histopathology results of subjects study

Histopathology	Referral type				*p*
	Emergency		Scheduled		
	n=69	%	n=84	%	
Accreta	19	27.5	12	14.3	0.07¥
Increta	29	42	25	29.7	0.06¥
Percreta	8	11.6	7	8.3	0.69¥
Not examined	13	47.6	40	47.6	<0.01¥*

Information: * Significant ($p < 0.05$); ¥ Continuity Correction

participation of patients with any health insurance shows good preparation from patients.

The estimation for antepartum haemorrhage will occur in 35 was 4.7% and will increase by gestational age, 15% at 36 weeks, 30% at 37 weeks and 59% at 38 weeks. To avoid emergency surgery, which can increase maternal and perinatal morbidity and mortality, the time of delivery is suggested at 34–35 weeks.[8]

Uterine wounds from the history of cesarean section, uterine surgery, curettage etc, were a risk factor for placenta accreta spectrum because of decidualization that results break scar breakage in the uterus and leads to abnormal invasion of the placenta in the next pregnancy.[11] Placenta previa is one of the most risk factors for placenta accreta spectrum.[12]

Placenta accreta spectrum can cause emergency

problems, both in pregnancy and delivery, because of massive hemorrhage from the placenta, so it must be given fast and adequate treatment, causing the patient to be referred by emergency referral.[8] Cesarean hysterectomy was the most common treatment applied for placenta accreta spectrum to avoid continuous hemorrhage.[13]

Finance was an important thing to prepare before the delivery of every pregnancy, especially in suspected placenta accreta, which requires more preparation, including a multidisciplinary team, blood preservation, and an intensive care unit, so it needs more finance.

The most common type of finance used in the emergency referral group was government aid insurance (52.2%), while the most common type of finance used in the scheduled referral group was non-government aid insurance (64.3%). This showed the patient's readiness for high-risk delivery finance. The most emergency referral patients registered from the emergency unit (74%), and the most scheduled referral patients registered from the policlinic. Patients with maternal and or perinatal emergencies should get emergency referral by the emergency unit in order to receive optimum and on-time treatment.

Palacios explains classification for wide placental invasion based on focal (placental invasion less than 50% of one anterior side of uterus) and diffuse (placental invasion more than 50% of one anterior side of the uterus) which shows the success of conservative surgery of the uterus in focal placenta accreta.[24] Suspicious for placenta accreta at vaginal delivery based on FIGO criteria if no separation of the placenta with synthetic oxytocin and gently controlled cord traction and attempts at manual removal of placenta result in heavy bleeding from the placental implantation site, requiring a mechanical or surgical procedure.[25] Vaginal delivery in the placenta accreta spectrum is from late diagnosis when patients get antenatal care.[8] Massive hemorrhage at placenta accreta spectrum because of separation of the placenta from its implantation site, if late to give treatment or inadequate therapy, placenta accreta spectrum can lead to another morbidity such as massive haemorrhage, massive blood transfusion, DIC *(Disseminated Intravascular Coagulation)*, ARDS *(Adult Respiratory Distress Syndrome)*, electrolyte imbalance, bladder injury, ureter lesion or kidney failure.[16]

The American College of Obstetrics and Gynecology (2012) announced a statement and opinion that the placenta accreta spectrum is a life-threatening condition and requires a multidisciplinary team. The maternal rate of placenta accreta spectrum was about 0,13% until 23%.[8]

A systematic review from the American Journal of Obstetrics and Gynecology tells us about histopathology results from placenta accreta spectrum with placenta accreta 473 from 757 (62,5%), placenta increta 117 from 757 (15,4%) and placenta percreta 167 from 757 (22,1%).[11] The histopathology result of this study was overall 100 (65,3%) subjects appropriate for placenta accreta, 31 (20,6%), placenta increta, 54 (35,35) and placenta percreta, 15 (9,8%) and not examined (34,6%).

Many newborns with prematurity were found in the emergency referral group, by the mean of gestational age, which had a significant difference between emergency and scheduled referral. The time of delivery for placenta accrete spectrum based ACOG/SMFM, FIGO, RCOG, and SOGC was 34 weeks until before 37 weeks gestational age, which includes preterm pregnancy. Several patients had a delay in diagnosis and were referred after 37 weeks.

One of the purposes of the management of placenta accreta spectrum was to deliver viable babies before mother experiences morbidity and mortality and deliver complicated fetuses as soon as possible, like fetal distress caused by antepartum hemorrhage or abruption of the placenta at placenta accreta spectrum.[8] Scheduled referral significantly decreases the probability of asphyxia in newborns from the placenta accreta spectrum.

Perinatal mortality was significantly higher in emergency referrals than in scheduled referrals. There were 2 babies with intra-uterine fetal death and 2 babies with stillbirth (p=0.039). Antepartum hemorrhage and prematurity affect to well-being of the fetus and delivered baby.[8]

To achieve a proper scheduled referral for suspected placenta accreta spectrum, accurate screening with a good medical history for risk factors of placenta accreta spectrum and ultrasound examination are needed, so when taking antenatal care with obstetricians, it could diagnose with suspected placenta accreta spectrum. An on-time scheduled referral can help to give optimal management of placenta accreta spectrum, so we can avoid maternal and perinatal morbidity and mortality. Further studies are needed to evaluate the factors that affect the referral type in placenta accreta spectrum disorders and other risk factors that impact maternal and perinatal outcomes.

We were limited by the retrospective cohort of this study. The quality of our measures may be affected by the quality of documentation available for the 4-year study period, as well as changes in documentation possible over the tenure of the project, such as implementation of an electronic medical record. So there were several confounding factors from this study.

CONCLUSION

Emergency referral had higher risk for caesarean hysterectomy, vaginal delivery, maternal haemorrhage, blood transfusion, intensive care unit, prematurity, asphyxia and perinatal mortality than scheduled referral

in placenta accreta spectrum.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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