Labour Outcomes After Successful External Cephalic Version Compared With Spontaneous Cephalic Version

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Abstract

Objective: This study sought to compare obstetrical outcomes for women with a cephalic presentation at birth resulting from successful external cephalic version (ECV) compared to those resulting from spontaneous cephalic version (SCV).

Methods: Secondary analysis was performed on Early External Cephalic Version Trial data. A total of 931 study participants had breech presentations between 34 and 36 weeks' gestation and cephalic presentations at birth. The incidence of intrapartum interventions was compared between patients with successful ECV (557) and those with SCV (374). A generalized linear mixed model was used to determine ORs for our primary outcomes. Parity, maternal BMI, previous CS, and enrolment centre were controlled for in the analysis.

Results: No differences were found after ECV compared with SCV in the incidence of CS (96 of 557 and 76 of 374, respectively; adjusted OR [aOR] 0.89; 95% CI 0.63−1.26), instrumental birth (68 of 557 and 29 of 373, respectively; aOR 1.55; 95% CI 0.96−2.50), or normal vaginal birth (393 of 557 and 268 of 373, respectively; aOR 0.92; 95% CI 0.68−1.24). Multiparous women with successful ECV were half as likely to require a CS compared with those with SCV and no ECV (28 of 313 and 42 of 258, respectively; aOR 0.45; 95% CI 0.26−0.80).

Conclusion: This is the first study to compare birth outcomes of breech pregnancies that convert to cephalic presentation by means of SCV with birth outcomes of breech pregnancies that have ECV. Women with a cephalic-presenting fetus at birth as a result of successful ECV are not at greater risk of obstetrical interventions at birth when compared with women with fetuses who spontaneously turn to a cephalic presentation in the third trimester.

Key Words: External cephalic version, spontaneous cephalic version, Caesarean delivery, instrumental vaginal birth

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Résumé

Objectif : Cette étude avait pour but de comparer les issues obstétricales d'accouchements où la présentation céphalique du fœtus a été obtenue à la suite d'une version par manœuvre externe (VME) ou d'une version spontanée (VS).

Méthodologie : Nous avons effectué une analyse secondaire des données recueillies lors de l'essai Early External Cephalic Version Trial, qui portait sur les versions précoces par manœuvres externes. Au total, 931 femmes dont le fœtus se présentait par le siège entre la 34^{e} et la 36^{e} semaine de gestation et par la tête à l'accouchement ont été retenues. Nous avons comparé l'incidence des interventions intrapartum pratiquées chez les patientes ayant subi une VME efficace (557) à celle des interventions pratiquées chez les patientes pour lesquelles une VS a eu lieu (374). Les RC de nos critères d'évaluation principaux ont été déterminés selon un modèle linéaire mixte généralisé. L'étude a pris en compte la variabilité attribuable à la parité, à l'IMC de la mère, aux antécédents de césarienne et au centre de recrutement.

Résultats : La comparaison des issues obstétricales à la suite d'une VME et des issues à la suite d'une VS n'a pas montré de différence dans l'incidence des césariennes (96 sur 557 et 76 sur 374, respectivement; RC ajusté [RCA] : 0,89; IC à 95 % : 0,63−1,26), des accouchements instrumentaux (68 sur 557 et 29 sur 373, respectivement; RCA : 1,55; IC à 95 % : 0,96−2,50) et des accouchements vaginaux sans particularité (393 sur 557 et 268 sur 373, respectivement; RCA : 0,92; IC à 95 % : 0,68−1,24). Les femmes multipares chez qui la VME a été efficace étaient deux fois moins susceptibles d'avoir besoin d'une césarienne que les femmes ayant eu une VS et qui n'ont subi aucune VME (28 sur 313 et 42 sur 258, respectivement; RCA : 0,45; IC à 95 % : 0,26−0,80).

Conclusion : Il s'agit ici de la première étude comparant les issues obstétricales où la présentation céphalique du fœtus découlait d'une VS à celles où cette présentation est attribuable à une VME efficace. Le risque d'intervention obstétricale durant l'accouchement n'est pas plus grand chez les mères ayant subi une VME efficace que chez celles où une VS du fœtus a eu lieu au cours du troisième trimestre.

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INTRODUCTION

The incidence of breech presentation at term has been reported to be between 3% and 4%.[1] The Term Breech Trial concluded that planned CS is the safest mode of birth for the breech fetus, with no increased risk of mortality or morbidity for the mother compared with vaginal breech birth.[1,2] The findings of the Term Breech Trial led to an increased incidence of CS performed for breech presentation.[1,2] A history of CS is associated with an increased incidence of maternal and fetal morbidities in future pregnancies.[3] External cephalic version is considered a safe maneuver to turn the breech fetus manually through the maternal abdomen into a cephalic presentation in the latter part of pregnancy and before labour. The procedure results in a cephalic presentation approximately 60% of the time and has the potential to reduce the number of CSs performed for breech presentation.[4–6]

Pooled data in meta-analyses of studies evaluating the mode of birth among women with a cephalic presentation following successful ECV compared with women with cephalic presentations and no ECV (Table S1) have established a positive association between successful ECV and CS (Chan et al.,[7] risk ratio 2.04; 95% CI 1.43–2.91; and de Hundt et al.,[4] OR 2.19; 95% CI 1.73–2.76). Despite investigators' conclusions to the contrary, these results tend to cast doubt on the utility of performing ECV. However, no prior studies compared outcomes for women with successful ECV with outcomes in pregnancies in which the fetus was known to be breech in the last trimester but turned spontaneously into a cephalic presentation before birth. This raises questions about the comparability of the pregnancies and the clinical relevance of the findings. Fetuses that have remained in a breech presentation until the later gestational periods are likely different from those that are cephalic from mid-pregnancy. For example, there is a disproportionately large number of breech pregnancies with fetal anomalies, uterine abnormalities, and placentation abnormalities when compared with the general population.[8] To analyze birth outcomes after the ECV procedure itself, a more appropriate comparison group for successful ECV consists of those pregnancies in which the fetus is known to be breech in the third trimester and turns spontaneously to a cephalic presentation. The Early External Cephalic Version Trial data afforded the opportunity to study this population. The purpose of this secondary analysis was to evaluate the difference in mode of birth between breech pregnancies after 33 weeks' gestation that had a successful ECV at 34 or more weeks' gestation and were cephalic at birth compared with breech pregnancies after 33 weeks' gestation that experienced spontaneous cephalic version to cephalic presentation at birth.

ABBREVIATIONS

aOR	adjusted odds ratio
ECV	external cephalic version
EECV	Early External Cephalic Version [Trial]
RR	risk ratio
SCV	spontaneous cephalic version

METHODS

Data were collected from the Early External Cephalic Version Pilot and EECV2 Trial, including a total of 1775 women who gave informed consent and were randomized to either the early ECV group (ECV performed before term between 34+0 and 36+0) or the delayed ECV group (ECV performed at term, at or after term 37+0).[5,9] Ethical approval was obtained for both the pilot trial (University of Toronto Office of Research Services) and the EECV2 trial (University of British Columbia Clinical Research Ethics Board, reference number: C04-0348; and the Research Ethics Board of Hamilton Health Sciences Research Ethics Board, reference number: 07-122). Ethical approval was also obtained from each participating centre. Women were recruited from 83 centres in 22 countries between July 1999 and February 2002 for the EECV study and between December 2004 and June 2008 for the EECV2 trial.[5,9] To be included in the trials, women had to have a singleton pregnancy in breech presentation between 34+0 and 36+0 for the pilot trial and between 33+0 and 35+6 for the EECV2 trial with no contraindications to ECV, labour, or vaginal birth and no increased risk of unstable lie.[5,9] Breech presentation was confirmed by ultrasound assessment before study enrolment.[5,9] Women were not included if their mode of birth was already planned.[5,9] The study was approved by the research ethics boards at the coordinating sites and at all participating centres.[5,9]

The cohort for this secondary analysis was constructed using data from all participants from both EECV Trials who had not withdrawn or been lost to follow-up and had a cephalic-presenting fetus at birth. The cohort was then divided into a successful ECV group and an SCV group. We defined successful ECV as an ECV attempt that resulted in a cephalic presentation immediately following the procedure and a cephalic presentation at birth.[10] Participants with a cephalic presentation at birth because of successful ECV comprised the ECV group. The SCV group was composed of participants with a breech presentation at enrolment and a cephalic presentation at birth that was not the result of ECV. Most of the participants in

the SCV group did not receive an ECV attempt because they experienced SCV before their ECV appointment.

Data were analyzed using SPSS version 22.0 by IBM software (IBM Corp., Armonk, NY). Descriptive statistics are presented as the number and percentage for categorical variables or by mean, standard deviation, and range for continuous variables. Population characteristics were compared using the chi-square test for categorical variables and an independent Student *t* test for continuous variables. A directed acyclic graph was drawn using DAGitty online software (dagitty.net) to determine which variables were potential confounders (Figure S1).[11] Parity, maternal BMI at enrolment, previous CS, ECV attempt, amniotic fluid volume, station of presenting part in the maternal pelvis, and enrolment centre were identified as potential confounders. The analyses were stratified by parity to show any differences in the relationship between obstetrical outcomes and ECV resulting from parity, thereby making the results more clinically relevant. We used a generalized linear mixed model with centre as a random effect and maternal BMI at enrolment and previous CS as fixed effects in a multilevel regression model. In an international RCT, it is likely that women within a study centre will be more similar than women across different study centres. Controlling for centre as a random effect also accounts for centres with small numbers of participants and adds to the robustness of the results and thus was included in our analytic approach.[12] Although each centre was required to have experienced ECV practitioners, controlling for centre takes into account the differences in practitioner skill levels and differences in ECV procedure protocols, such as the use of tocolytic agents, which varied across sites.[5,9,12] Abnormal amniotic fluid volume was an exclusion criterion for the original studies and was thus controlled for at enrolment. ECV attempt could not be controlled for in the statistical analysis because all of the ECV group members received an ECV attempt and only a few members of the SCV group received an attempted (but unsuccessful) ECV. Thus, a sensitivity analysis was performed by adding to the ECV group those participants who received an unsuccessful ECV attempt in the SCV group. ORs and CIs were determined from the generalized linear mixed model, and significance was determined a priori to be *P* values <0.05.

RESULTS

A flow diagram of the study population can be seen in Figure 1. Of the 1775 participants from the EECV pilot and EECV2 trials, 931 had a cephalic-presenting fetus at birth. Of those cephalic-presenting fetuses, 557 were the result of successful ECV and 374 were the result of SCV. Maternal and neonatal characteristics are described and compared between groups in Table 1. There were significantly fewer nulliparous participants in the ECV group. Participants originally randomized to the early and late ECV groups were not equally distributed between the SCV and ECV groups for this secondary analysis. Placental location and maternal BMI at enrolment were also significantly different between groups, with more placentas in an anterior location and higher BMI in the SCV group.

Birth outcomes are displayed in Table 2. The overall incidence of CS was 17.2% in the ECV group and 20.3% in the SCV group. The difference in the incidence of CS between groups was nonsignificant, with an unadjusted OR of 0.82 (95% CI 0.58−1.14). The OR remained nonsignificant when controlled for potential confounders (adjusted OR 0.89; 95% CI 0.63−1.26). The sensitivity analysis of adding those in the SCV group with a failed attempted ECV to the successful ECV group did not change the results of our primary analysis.

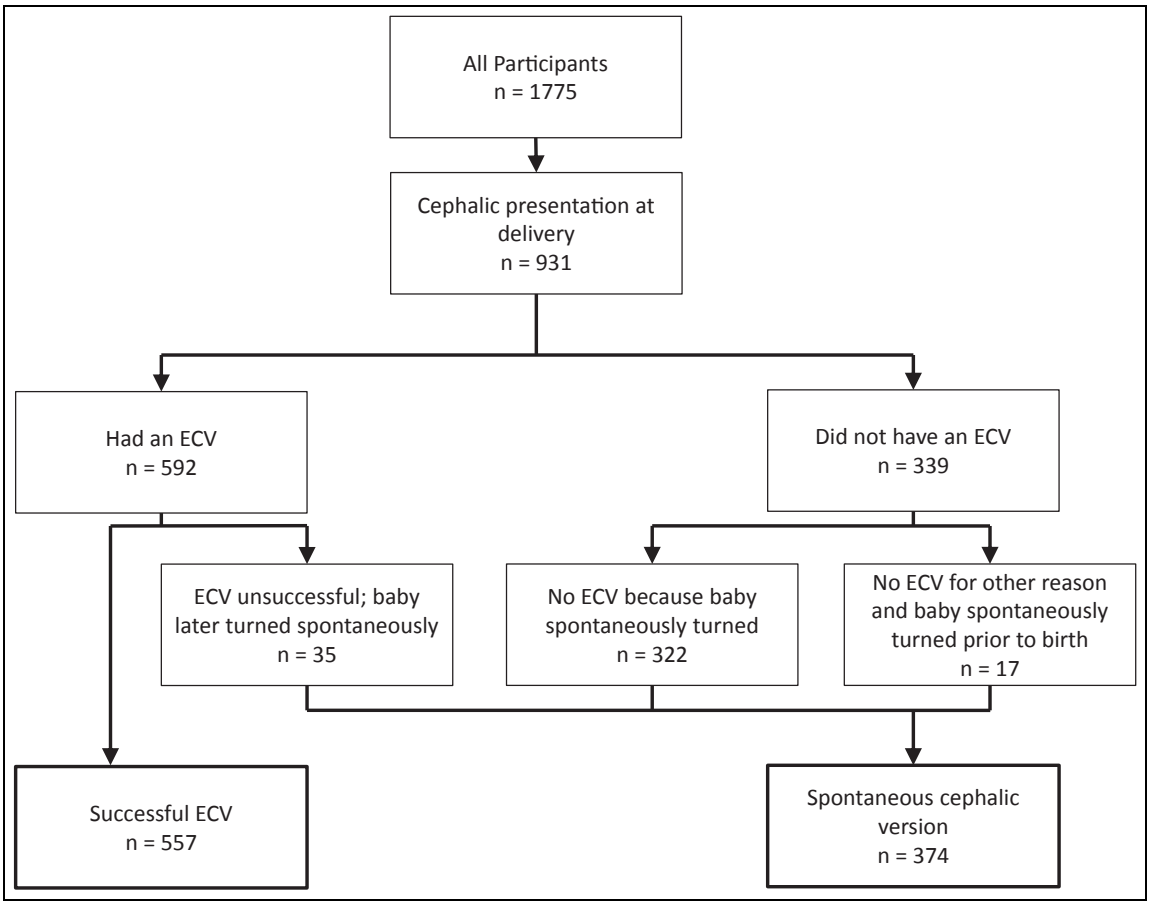
After stratifying by parity, 27.9% of nulliparous women had a CS in the ECV group compared with 29.3% in the SCV group. This difference was non-significant (OR 0.93; 95% CI 0.57−1.52) and remained nonsignificant in the adjusted model (aOR 1.03; 95% CI 0.61−1.73). Among multiparous participants, 8.9% in the ECV group gave birth by CS compared with 16.3% in the SCV group. This difference was statistically significant (OR 0.51; 95% CI 0.30−0.84) and remained significant in the adjusted model (aOR 0.45; 95% CI 0.26−0.80).

Overall, 12.2% of the births in the ECV group required instrumental assistance (either forceps or vacuum) to achieve a vaginal birth, and 7.8% in the SCV group required an instrumental vaginal birth. This difference was statistically significant in the unadjusted model, with an OR of 1.65 (95% CI 1.05−2.60), but it was non-significant in the adjusted model (aOR 1.55; 95% CI 0.96−2.50). After stratification by parity, no significant differences were found in either unadjusted or adjusted models.

DISCUSSION

In contrast to other studies that compared mode of delivery among women with successful ECV, we found that overall the incidence of CS or instrumental vaginal birth between the ECV and SCV group was no different. Parous women had significantly fewer CSs in the ECV group compared with the SCV group. The overall incidence of CSs in our study was 17.2% for the ECV group and 20.3%

Figure 1. Participant flow diagram.



in the SCV group. This CS frequency is similar to the incidence of CS after successful ECV of 20.7% found by de Hundt et al.[4] in their meta-analysis, and it is higher than the 10.9% incidence of CS found in their control group of spontaneously cephalic pregnancies.[4] We hypothesize that our study findings are different because we are comparing only pregnancies that were breech in the later weeks of pregnancy, hence the actual population of interest who might ultimately be considering ECV. This study provides a more useful comparison for clinicians and women because the outcomes reported are drawn only from the population of women with breech pregnancies. The results of these analyses should be generalizable to low-risk pregnancies globally in which ECV is routine because the study population included pregnancies with no contraindications to ECV or vaginal birth.[5,9]

The strengths of this study include the large sample size and our SCV comparator group derived from a population of women with third trimester breech pregnancies. Although we were unable to control for amniotic fluid volume in our statistical analysis, only participants with normal amniotic fluid levels were enrolled in the primary studies.[5,9] Station of the presenting part could not be controlled for because only participants who had undergone an attempted ECV procedure had data on station collected.

Our study design differs from those of previous studies in that we have examined CS and instrumental vaginal birth risk among women with cephalic presentations at birth whose fetuses were breech in the last trimester of pregnancy. All fetuses in our study spent a significant amount of time in breech presentation, thus enhancing the comparability of the groups. Meta-analyses comparing outcomes for pregnancies with a cephalic-presenting fetus at term resulting from successful ECV with outcomes in which the fetus was never known to be breech indicate an increased risk of CS after successful ECV.[4,7] However, those studies do not account for potential underlying differences in the maternal-fetal unit of pregnancies that have been breech until close to term gestation and those that have been in a cephalic presentation from much earlier in pregnancy.[13–15] The former may be at greater risk for CS even after version to a cephalic presentation because of inherent differences.

Table 1. Baseline characteristics

Characteristic	ECV (557) n (%)	Spontaneous cephalic version (374) n (%)	*P* value[a]
Maternal age (mean ± SD [range])	30.4 ± 5.94 (15.7–45.8)	30.5 ± 6.13 (15.7–46.7)	0.82
Missing	0 (0.0)	0 (0.0)	
Parity			
Nulliparous	116 (31.0)	244 (43.8)	**<0.001**
Multiparous	258 (69.0)	313 (56.2)	
Missing	0 (0.0)	0 (0.0)	
GA at birth (mean ± SD [range])	39.8 ± 1.30 (34.9–43.7)	39.9 ± 1.35 (34.9–44.9)	0.39
Missing	0 (0.0)	0 (0.0)	
Previous CS	32 (5.7)	18 (4.8)	0.54
Missing	0 (0.0)	0 (0.0)	
Maternal BMI at randomization (mean ± SD [range])	27.5 ± 4.64 (18.1–56.0)	28.8 ± 5.23 (16.9–49.1)	**<0.001**
Missing	6 (1.1)	6 (1.6)	
Birth weight (mean ± SD [range])	3425.5 ± 457.94 (1900–4883)	3445.3 ± 492.67 (1390–4870)	0.53
Missing	0 (0.0)	1 (0.3)	
Assigned study group			
Early	351 (63.0)	150 (40.1)	**<0.001**
Late	206 (37.0)	224 (59.9)	
Missing	0 (0.0)	0 (0.0)	
Took steps to encourage baby to turn apart from ECV	227 (41.7)	120 (35.4)	0.06
Missing	13 (2.3)	35 (9.4)	
Type of breech			
Frank	338 (60.8)	206 (56.1)	0.18
Complete	186 (33.5)	130 (35.4)	
Footling	32 (5.8)	31 (8.4)	
Missing	1 (0.2)	7 (1.9)	
Placental location			
Anterior	173 (31.2)	166 (44.9)	**<0.001**
Non-anterior	381 (68.8)	204 (55.1)	
Missing	3 (0.5)	4 (1.1)	
ECV attempted	557 (100.0)	35 (9.4)	**<0.001**
Missing	0 (0.0)	0 (0.0)	

SD: standard deviation.

[a]Bold indicates significant *P* value.

Nulliparity, higher maternal BMI, and anterior placenta location have all been explored as predictors of an unsuccessful ECV procedure; therefore, it is not surprising that the rates of these characteristics were lower in the ECV group.[16] Furthermore, significantly more participants were randomized to an early ECV procedure in the successful ECV group. An early successful ECV procedure would mask SCVs that would have occurred after the early ECV procedure window before term because recent research has shown that 24% of breech fetuses may still undergo SCV after 36–37 weeks' gestation.[17]

The decreased risk of CS in the ECV group for multiparas was an unexpected finding. It is possible that the very factors that prevent the likelihood of spontaneous version among the late-term breech fetus, such as engagement of the breech, are factors that favour vaginal birth, such as cephalopelvic adequacy. Fetuses that require ECV to turn to a cephalic presentation may not be able to turn spontaneously because they are deeper in the pelvis, which also could indicate a greater likelihood of a vaginal birth. The increased abdominal tone in the nulliparous population could have prevented the spontaneous version of the fetus in instances of disengagement because of poor fit. It should be noted that the incidence of CS in the multiparous SCV group was higher than has been reported for low-risk multiparous pregnancies.[18]

CONCLUSION

Our results challenge the association between the ECV procedure and obstetrical interventions among fetuses that present in the last trimester as breech. When

Table 2. Unadjusted and generalized linear mixed model analysis for birth outcomes

Outcome	Obstetrical Outcome n (%)	OR (95% CI)[a]	aOR (95% CI)[b]
CS			
Total			
ECV (557)	96 (17.2)	0.82 (0.58–1.14)	0.88 (0.62–1.26)
SCV (374)	76 (20.3)	1.0	1.0
Nulliparous			
ECV (244)	68 (27.9)	0.93 (0.57–1.52)	1.03 (0.61–1.73)[c]
SCV (116)	34 (29.3)	1.0	1.0
Multiparous			
ECV (313)	28 (8.9)	**0.51 (0.30–0.84)**	**0.45 (0.26–0.80)**[d]
SCV (258)	42 (16.3)	1.0	1.0
Instrumental vaginal birth			
Total			
ECV (557)	68 (12.2)	**1.65 (1.05–2.60)**	1.55 (0.96–2.50)
SCV (373)[e]	29 (7.8)	1.0	1.0
Nulliparous			
ECV (244)	47 (19.3)	1.29 (0.71–2.33)	1.26 (0.68–2.36)[c]
SCV (115)[e]	18 (15.7)	1.0	1.0
Multiparous			
ECV (313)	21 (6.7)	1.62 (0.76–3.42)	1.25 (0.62–2.52)[d]
SCV (258)	11 (4.3)	1.0	1.0
Spontaneous vaginal birth without instrumental assistance			
Total			
ECV (557)	393 (70.6)	0.94 (0.70–1.26)	0.92 (0.68–1.24)
SCV (373)[e]	268 (71.8)	1.0	1.0
Nulliparous			
ECV (244)	129 (52.9)	0.93 (0.59–1.45)	0.86 (0.54–1.36)[c]
SCV (115)[e]	63 (54.8)	1.0	1.0
Multiparous			
ECV (313)	264 (84.3)	1.39 (0.91–2.14)	1.55 (0.97–2.47)[d]
SCV (258)	205 (79.5)	1.0	

[a]Bold indicates significant OR.

[b]Adjusted ORs exclude 12 participants who were missing BMI data.

[c]Adjusted by: random effect, centre; fixed effect, BMI.

[d]Adjusted by: random effect, centre; fixed effects, BMI and previous CS.

[e]One participant delivered outside of the study site, and the only delivery data available were that the woman had a vaginal cephalic birth and no CS. No information was available about instrumental vaginal birth, so this participant was removed from the instrumental vaginal birth and spontaneous vaginal birth without instrumental assistance analyses.

discussing the option of ECV with women, it is important to highlight that cephalic pregnancies that were breech late in pregnancy are at greater risk for CS when compared with spontaneously cephalic-presenting pregnancies, regardless of the method of version. However, the ECV procedure is safe, with very low rates of complications, and attempting ECV lowers the risk of CS when compared with breech pregnancies that did not receive an ECV attempt.[5] A CS holds a greater risk to maternal health than a vaginal cephalic birth and increases the risks for maternal morbidity in future pregnancies.[19] Our results indicate that overall there is no greater incidence of obstetrical interventions after successful ECV when compared with SCV among fetuses who are breech in late pregnancy and who would be candidates for ECV.

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jogc.2017.05.020.

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